

# ANNEX D: MATERIEL

## Introduction

This annex provides a brief description and status of key Army materiel programs contained in the FY06 Presidential Budget (PB06). These programs develop and field new equipment systems, provide incremental improvements to existing systems, or recapitalize existing fielded systems by rebuilding to a zero-miles/-hours condition and upgrading system capabilities.

These materiel programs are part of a comprehensive and integrated doctrine, organization, training, materiel, leadership and education, personnel and facilities (DOTMLPF) modernization solution to execute the Army's core competencies: (1) train and equip Soldiers and grow leaders; and (2) provide relevant and ready land power capability to the combatant commander as part of the joint team.

## Equipping Objectives

Army equipping efforts are focused to support the following objectives:

- The Army's highest priority is to field systems and provide needed capabilities to both Active and Reserve Component (AC/RC) units deployed (or in the process of deploying) in support of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). As a part of this effort, the Army has created a "pool" of equipment in theater referred to as "stay-behind equipment" (SBE) that units will draw upon on their arrival. The use of SBE allows

the Army to provide units with required capabilities (such as armored HMMWVs and cargo trucks) while minimizing shipping time and transportation costs. Based on requests by the combatant commanders, units may also be provided additional equipment with improved capabilities while they are deployed.

- Execution of Army transformation as directed in the Army Campaign Plan
- Develop capabilities consistent with joint interdependence and conducting operations in a joint, interagency and multinational (JIM) environment. Accelerate the development and fielding of Future Force capabilities for insertion where feasible into the Current Force.
- Conversion of the Current Force units to a modular design. Previous conversions (FY04) included the brigades and division headquarters of the 3rd Infantry Division, 10th Mountain Division, and 101st Air Assault Division. FY04 conversion activities included the activation of an additional modular brigade for the 3rd Infantry Division, 10th Mountain Division, and 101st Air Assault Division. FY05 modular conversion includes the 4th Infantry Division (convert existing units and activate an additional Brigade Combat Team or BCT), I Corps (converts to a Unit of Employment or UEx design), and the activation of two additional BCTs (one each for the 10th Mountain Division and 25th Infantry Division).

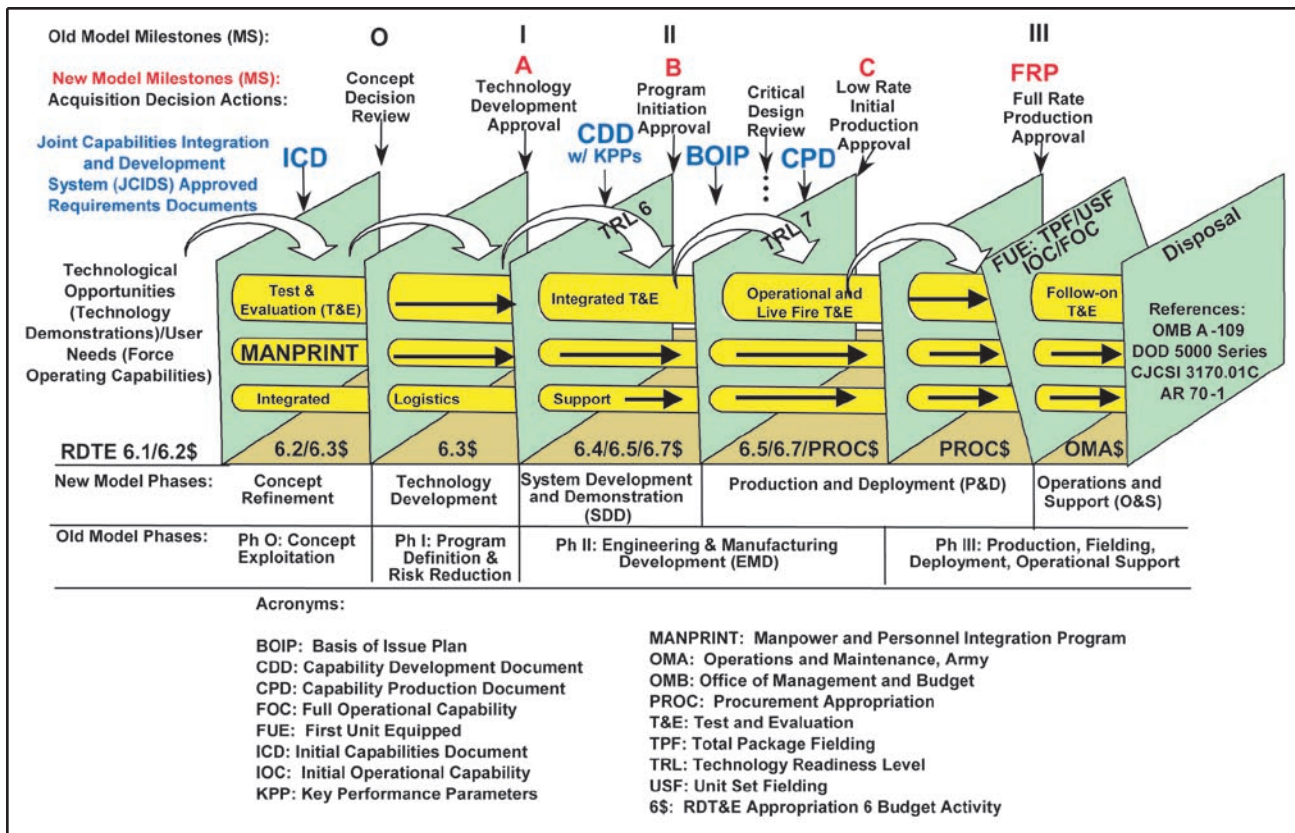


Figure D-1. System Acquisition Management Process

- Field Stryker, Future Combat Systems (FCS), and other systems by Unit Set Fielding (USF) to meet established time lines for achieving an initial operational capability (IOC) for the unit and its interdependent system-of-systems (SoS) set.
- Rapid fielding and rapid equipping initiatives leverage current programs and commercial off-the-shelf (COTS) technology to give the Soldier increased survivability, mobility and lethality capabilities.

These objectives are supported by a host of initiatives and plans that include: setting the force/reset plans, Stryker Brigade Combat Team (SBCT) and UA USF plans, recapitalization plans, software blocking, Battle Command Way Ahead plan, Army National Guard Division Redesign Study (ADRS), Army Medical Department (AMEDD) transformation initiatives, Army Materiel Command (AMC) re-

structuring, logistics transformation initiatives, infrastructure plans, and unit focused stability and rotation plans. Most of these initiatives and plans are highlighted throughout the *2005 Army Modernization Plan*.

### The Acquisition Phases and Developmental Processes

The materiel programs described in this annex are in various phases of the acquisition management life cycle. Figure D-1 depicts the acquisition management process and management milestones for reference. Both the new and old terms are provided because programs initiated under the old life-style model still use those terms. Definitions for these phases and other acquisition terms can be found in the DOD 5000 Defense Acquisition Policy documents.

Evolutionary acquisition is the DOD-preferred strategy being used by the Army to rapidly acquire materiel systems with mature technologies for the user. This strategy delivers capabilities in increments, with the recognition that future improvements in capability will be needed. The objective is to balance needs and available capability with resources, and to put capability into the hands of the user quickly. Success of this strategy is dependent upon consistent and continuous definition of requirements, maturation of technologies, and continuous collaboration between the user, tester, and developer to develop and produce systems with increasing capability towards a materiel concept. Figure D-2 depicts this requirements and acquisition process.

Evolutionary acquisition uses two key processes, incremental and spiral development, to provide for continuous discovery and development of technology for military applications that enhance Joint Force capabilities.

Through the incremental development process, a desired capability is identified and the required end state is defined. That requirement is met over time by the development of several increments, each dependent on available mature technology. The requirement for future increments is based upon the ability to fill the gap between the current capability and the objective capability (100 percent design concept) for a system.

Through the spiral development process, a desired capability is identified, but the end-state requirements are unknown at program initiation. Those requirements are refined through experimentation, risk management, and continuous user feedback to provide the best possible capability within an increment. The requirement for future spiral development is dependent upon user feedback and technology maturation.

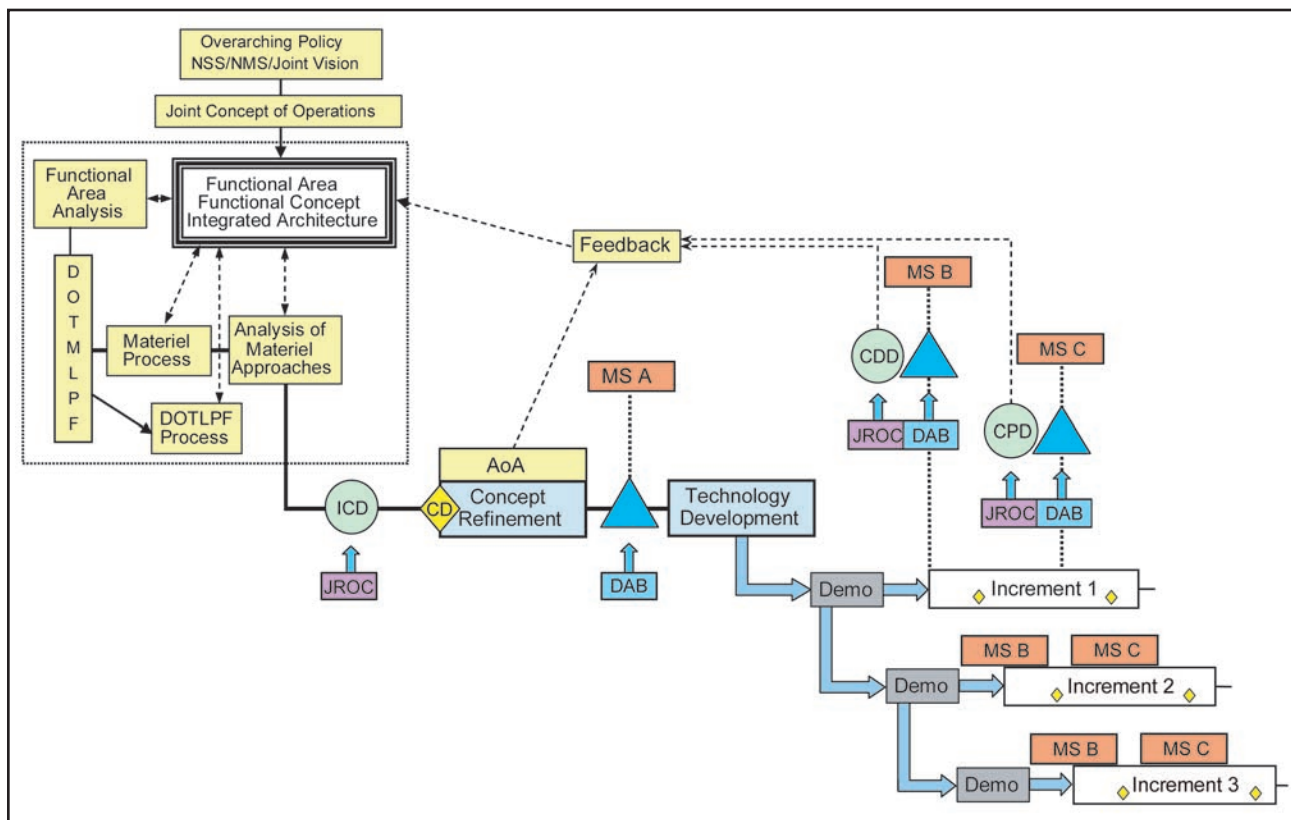


Figure D-2. Requirements and Acquisition Process

Both spiral and incremental development require close coordination between materiel and training developers to ensure training products and plans are developed to support the new capabilities provided by each increment and any spiral developments applied outside an increment cycle to existing systems.

## Developing Capabilities for the Future Joint Force

The Army is modernizing its Current Force to remain a relevant and ready component of the Joint Force that meets near-term operational challenges while continuously pursuing truly transformational changes to develop a Future Force over time. The Joint Capabilities Integration and Development System (JCIDS) is the new top-down joint capabilities-based requirements generation process that will guide Army and the other Services' investment in transformational capabilities for the future Joint Force. The Joint Operations Concepts (JOpsC) is the first step in this process that translates strategic guidance to desired joint

capabilities. It is an overarching concept and construct that provides the operational context for transformation by linking strategic guidance with the integrated application of Joint Force capabilities. The JOpsC describes how the Joint Force intends to operate 15-20 years in the future across the entire range of operations.

The JOpsC is a unifying framework for developing supporting Service concepts, subordinate joint operational, functional, and enabling concepts, and a set of integrated operational, technical, and system architectures that look at existing, evolving, and future Joint Force requirements. These concepts and architectures will be validated through joint analysis, experimentation and lessons learned to guide future joint- and Service-led modernization efforts.

## Joint Functional Concepts

There are five appendices to this annex. Each appendix is aligned with one of the

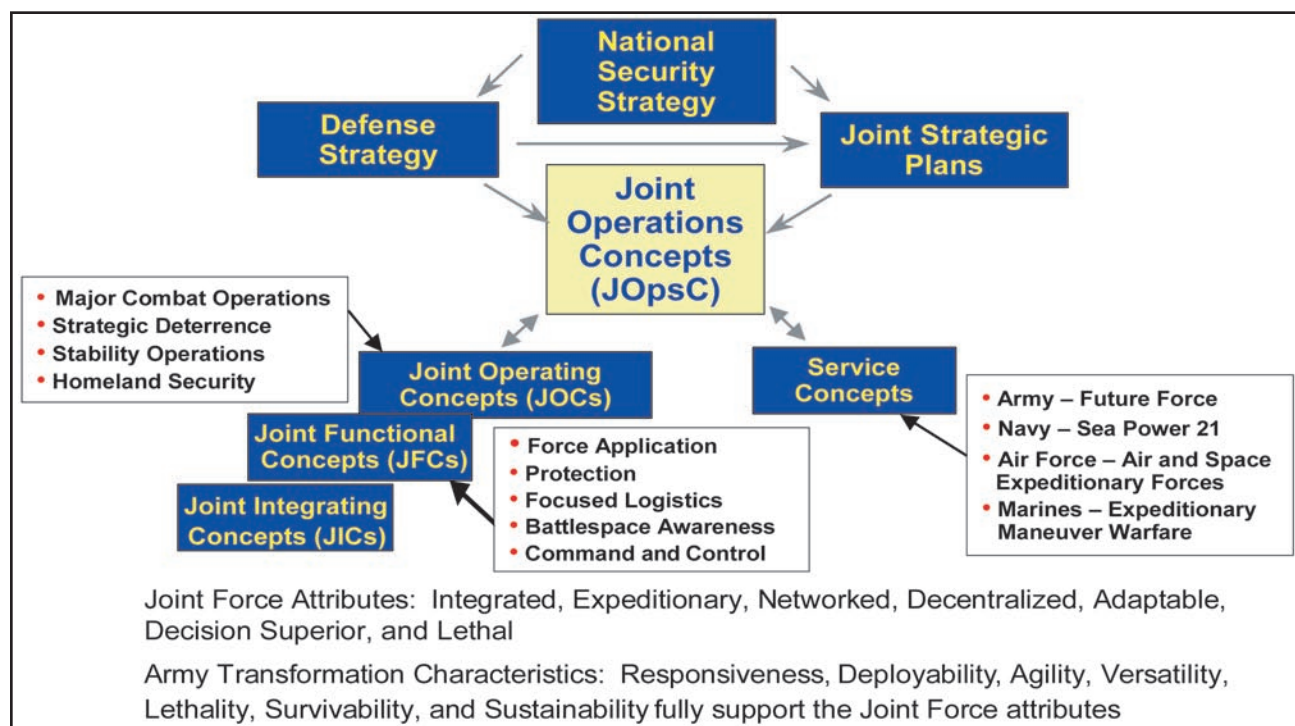


Figure D-3. Joint Operations Concept Framework

five functional concepts of force application, protection, focused logistics (FL), battlespace awareness (BA), command and control (C2) and net-centric. Each functional concept describes the approach for providing a particular military capability across the range of military operations. Under JCIDS, the J8 is using these functional capability categories to focus joint analysis. Programs that provide more than one functional capability are assigned a lead Joint Warfighting Capability Assessment (JWCA) team with one or more supporting JWCAs to do the analysis up front of proposed concepts and DOTMLPF solutions. A designated Functional Capability Board (FCB), which is also aligned with one of these five emerging Joint Functional Concepts, validates this analysis and forwards recommendations to the Joint Requirements Panel and Joint Requirements Oversight Committee that provides top-down guidance and direction to the Services on their modernization programs.

In this annex, Army materiel programs with more than one functional capability are described only once within a functional capability appendix that best follows the current portfolio of the five FCBs described below and as aligned in the equipping resourcing framework used to organize the Army equipping program.

Force application capabilities are those that cause an effect on the enemy. The force application FCB portfolio includes land, maritime, information, space, psychological, deception, and special operations; joint targeting and fires; conventional, nuclear, and electronic attack; and suppression against enemy air defense. Appendix 1, Force Application, provides a description and status on the following PB06-funded materiel programs:

## **Aviation Modernization**

AH-64 Apache  
Armed Reconnaissance Helicopter (ARH)  
Light Utility Helicopter (LUH)  
UH-60 Black Hawk  
CH-47 Chinook  
Fixed Wing  
Hellfire Family of Missiles  
Advanced Precision Kill Weapon System (APKWS)  
Aircraft Survivability Equipment (ASE)  
Aviation Electronics (Avionics)  
Aircrew Integrated Systems (ACIS)  
Air Traffic Services/Air Traffic Control (ATS/ATC)  
Aviation Ground Support Equipment (AGSE)  
Aircraft Component Improvement Program (ACIP)  
Training Aids, Devices, Simulators and Simulations (TADSS)

## **Soldier Modernization**

Soldier as a System (SaaS)  
Ground Soldier System (GSS)  
Mounted Warrior (MW)  
Air Warrior (AW)  
Enhanced Night Vision Goggles (ENVG)  
Thermal Weapon Sights ((TWS)  
Objective Individual Combat Weapon (OICW) Increment 1  
XM307 Objective Crew Served Weapon (OCSW)  
Lightweight Laser Designator Range Finder (LLDR)  
Nonlethal Capabilities Set (NLCS)

## **Ground Force Modernization**

Abrams Tank  
Bradley Fighting Vehicle  
Stryker Family of Armored Vehicles  
Lightweight 155 Howitzer (M777)

Future Combat Systems (FCS)  
 Non-Line-of-Sight Cannon (NLOS-C)  
 Non-Line-of-Sight Launcher System (NLOS-LS)  
 High Mobility Artillery Rocket System (HIMARS)  
 Army Tactical Missile System (ATACMS) Family of Munitions  
 Chemical Energy Missiles—Javelin and TOW 2B  
 Guided MLRS (GMLRS) Rocket  
 120 mm XM395 Precision Guided Mortar Munition (PGMM)  
 Excalibur  
 Course Correcting Fuze (CCF)  
 Mid-Range Munition (MRM)

Protection capabilities prevent an enemy's effect on us. The protection FCB portfolio includes personnel and infrastructure protection, nonproliferation and counterproliferation, and consequence management. Appendix 2, Protection, provides a description and status on the following PB06-funded materiel programs:

#### **Air and Missile Defense (AMD) Modernization**

PAC-3/MEADS Combined Aggregate Program (CAP)  
 Terminal High Altitude Area Defense (THAAD)  
 Surface-Launched Advanced Medium-Range Air-to-Air Missile (SLAMRAAM)  
 Ground-Based Midcourse Defense (GMD) Segment  
 Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS)  
 Sentinel  
 Air Defense and Airspace Management (ADAM) Cell  
 Joint Tactical Ground Station (JTAGS) Multi-Mission Mobile Processor (M3P)  
 Air and Missile Defense Command and Control System (AMDCCS)

#### **Chemical, Biological, Radiological, Nuclear and High Yield Explosives (CBRNE) Defense Modernization**

M31/M31A1/M31E2 Biological Integrated Detection System (BIDS)  
 Stryker-NBCRV  
 M56 Wheeled Smoke System (Coyote)  
 Vehicle Obscuration Smoke Systems (M6 and M7)  
 Chemical Biological Protection Shelter (CBPS)  
 Collectively Protected Deployable Medical System (CP DEPMEDS)  
 Sorbent Decontamination System, M100  
 Joint Portal Shield Detector System (JPS)  
 Joint Service Lightweight Chemical Agent Detector (JSLSCAD)  
 Joint Service Lightweight NBC Recon System (JSLNBCRS)  
 Joint Chemical Agent Detector (JCAD)  
 Joint Warning and Reporting Network (JWARN)  
 Joint Service Man-Portable Decontamination System (JSM-PDS)  
 Joint Service Sensitive Equipment Decontamination (JSSED) System  
 Joint Service Transportable Decontamination System (JSTDS)  
 Joint Service Personnel/Skin Decontamination System (JSPDS)  
 Joint Service Sensitive Equipment Decontamination Joint Platform Interior Decontamination System (JSSED-JPID)  
 Joint Service General Purpose Mask (JS-GPM)  
 Joint Biological Agent Identification and Diagnostic System (JBAIDS)  
 National Guard Weapons of Mass Destruction Civil Support Team (WMD-CST) Unified Command Suite (UCS)  
 National Guard Weapons of Mass Destruction Civil Support Team (WMD-CST) Analytical Laboratory Suite (ALS)

## CBRNE Installation Protection Program (IPP)

Focused logistics (FL) capabilities sustain and support the force. The FL FCB portfolio includes deployment distribution, sustainment, medical, mobility, and logistics command and control. Appendix 3, Focused Logistics, provides a description and status on the following PB06-funded materiel programs:

### Counter-IED Modernization

Warlock

### Lift Equipment Modernization

Joint High Speed Vessel (JHSV) (formerly the Theater Support Vessel (TSV))  
Joint Precision Airdrop Systems (JPADS)

### Assured Mobility Modernization

AN/PSS-14 Handheld Standoff Mine Detection System (HSTAMIDS)  
Ground Standoff Minefield Detection System (GSTAMIDS)  
Spider (Antipersonnel Land Mine Alternative (APL-A))  
Improved Ribbon Bridge (IRB)  
Rapidly Emplaced Bridge System (REBS)  
Dry Support Bridge (DSB)

### Sustainment Modernization

Transportation Coordinator's Automated Information for Movement System II (TC-AIMS II)  
Movement Tracking System (MTS)  
Battle Command Sustainment Support System (BCS3) [previously the Combat Service Support Control System (CSSCS)]  
Global Combat Support System (GCSS) Army  
Combat Service Support Automated Information System Interface (CAISI)

Combat Service Support (CSS) Satellite Communications (SATCOM)

Advanced Aviation Forward Area Refueling System (AAFARS)

Tactical Electric Power (TEP)

Standard Automotive Tool Set (SATS)

Family of Medium Tactical Vehicles (FMTV)

High Mobility Multipurpose Wheeled Vehicle (HMMWV)

Heavy Expanded Mobility Tactical Truck (HEMTT)

Palletized Load System (PLS)

Containerized Kitchen (CK)

Unit Water Pod System (Camel)

Load Handling System (LHS) Compatible Water Tank Rack System (Hippo)

Load Handling System Modular Fuel Farm (LMFF)

1,500-GPH Tactical Water Purification System (TWPS)

Rapidly Installed Fluid Transfer System (RIFTS)

Rough Terrain Container Handler (RTCH)

Container/Material Handling Equipment (C/MHE)

Maintenance Support Device (MSD)

Medical Communications for Combat Casualty Care (MC4) System

Man-Transportable Robotic System (MTRS)

Forward Repair System (FRS)

Tactical Water Purification Systems (TWPS)

Battlespace awareness (BA) capabilities collect, analyze and process battlespace information. The BA FCB portfolio includes all source intelligence collection, environmental data collection, predictive analysis, and knowledge management. Appendix 4, Battlespace Awareness, provides a description and status on the following PB06-funded materiel programs:

Distributed Common Ground System-Army (DCGS-A)

All Source Analysis System (ASAS)

Aerial Common Sensor (ACS)  
 Advanced Field Artillery Tactical Data System  
 (AFATDS)  
 Long-Range Advanced Scout Surveillance  
 System (LRAS3)  
 Tactical Exploitation System (TES)  
 Integrated Meteorological System (IMETS)  
 Prophet  
 Tactical Unmanned Aerial Vehicle (TUAV)  
 Shadow 200  
 Counterintelligence/Human Intelligence Infor-  
 mation Management System (CHIMS)

Command and control (C2) capabilities plan,  
 prepare, and direct execution of missions.  
 The C2 FCB portfolio includes common  
 operational picture (COP), joint C2, com-  
 munications and computer environment, and  
 own force information collection. Appendix 5,  
 Command and Control, provides a descrip-  
 tion and status on the following PB06-funded  
 materiel programs:

Army Battle Command System (ABCS)  
 Global Command and Control System-Army  
 (GCCS-A)  
 Mounted Battle Command on the Move (MB-  
 COTM)  
 Maneuver Control System (MCS)  
 Army Airborne Command and Control System  
 (A2C2S)  
 Air and Missile Defense Command and Con-  
 trol System (AMDCCS)  
 Space Support Element Toolkit (SSET)  
 Force XXI Battle Command Brigade and Be-  
 low (FBCB2)  
 Grenadier BRAT (GB) and Mini-Transmitter  
 (MTX) Blue Force Tracking (BFT) Sys-  
 tem  
 Satellite Communications (SATCOM)  
 Combat Service Support (CSS) Satellite  
 Communications (SATCOM)  
 Global Positioning System (GPS)  
 Single Channel Ground and Airborne Radio  
 System (SINCGARS)

Warfighter Information Network-Tactical  
 (WIN-T)  
 Joint Tactical Radio System (JTRS)  
 Bridge-to-the-Future Network (BFN)  
 Joint Network Node (JNN), (formerly known  
 as the Area Common User System Mod-  
 ernization Plan (ACUS MP)

## Appendix 1: Force Application

Force application is the sum of all actions tak-  
 en to cause desired effects on our adversary.  
 Force application encompasses all aspects  
 of fires and maneuvers that suppress, neu-  
 tralize, seize or destroy an objective. These  
 effects are conducted with precision—in time,  
 sequence, location, duration and intensity—in  
 order to apply immediate and continuous  
 pressure on enemy capabilities. These ac-  
 tions occur in all domains—land, maritime,  
 space and cyberspace—and include conven-  
 tional and unconventional operations using  
 conventional weapons, nonlethal weapons or  
 nuclear weapons. These actions are enabled  
 by offensive information operations (IO).

The Joint Force—adept at overcoming anti-  
 access and area-denial strategies, attacking  
 throughout the depth and breadth of the  
 battlespace, and defeating fixed and mobile  
 targets in all terrain and weather conditions  
 across the full spectrum of conflict—requires  
 a broad range of force application capabilities.  
 The Army provides significant force applica-  
 tion capabilities through sustained land domi-  
 nance using conventional and unconventional  
 air and ground maneuver forces that gain and  
 maintain a positional advantage with decisive  
 speed and overwhelming operational tempo.  
 This dominant maneuver capability enhances  
 the timeliness, range, precision, and impact  
 of joint fires. Enabled by space, airborne and  
 ground-based systems that provide robust  
 command, control, communications, and

computer (C4) and intelligence, surveillance and reconnaissance (ISR) and an enhanced suite of kinetic and nonkinetic munitions, the Army provides lethal and precise fires for the joint force commander.

In conjunction with the Joint Force, the Army provides full-spectrum forces that are able to integrate maneuver, fires and IO across the full range of military operations. These include conducting operational maneuver from strategic distances; conducting mobile strike operations; closing with and destroying enemy forces; applying precision fires and maneuver; exercising information superiority; commanding and controlling joint and multinational forces; and providing direct, continuous, and comprehensive control over terrain, resources, and people.

The Army is equipping the Soldier to continue to provide force application capabilities required in the evolving security environment. This appendix provides a brief discussion of the Army's force application capabilities that provide the Joint Force dominant air and ground maneuver coupled with precision engagement and the key materiel programs associated with these capabilities. While materiel programs that support operational maneuver from strategic distances and assure mobility are force application capabilities supporting dominant maneuver, these programs are described in this annex under Appendix 3, Focused Logistics, given that deployment distribution and mobility are areas within the current FL FCB portfolio.

### **Aviation Capabilities**

Aviation's strength is its ability to deploy quickly, maneuver rapidly, focus tremendous combat power, and achieve surprise and positional advantage. It is instrumental in achiev-

ing simultaneous, distributed and continuous combined arms air-ground operations.

With its manned and unmanned assets, aviation organizations develop situations from contact with the enemy, maneuver to positions of advantage, engage enemy forces beyond the range of their weapons, destroy them with precision fires, and provide close support. Its inherent mobility, flexibility, agility, lethality, and versatility are instrumental in enabling the air-ground task force commander to conduct decisive joint operations.

Aviation conducts maneuver, maneuver support, and maneuver sustainment operations across the spectrum of conflict. Highly skilled and knowledgeable aviation Soldiers employing aviation systems from entry operations to decisive action provide a significant contribution to the quality of firsts (see first, understand first, act first, and finish decisively). Aviation operations develop the COP, shield the maneuver force, shape the battlefield, extend the tactical and operational reach of the maneuver commander, and sustain the force. Aviation is critical to the Army's stability and support requirements, to include the homeland security requirements of our nation. Modernization and sustainment of Army aviation ensures these capabilities are maintained.

### **Aviation Modernization**

Aviation modernization and recapitalization of existing aviation systems projected to remain in the fleet into the 2015-25 time frame are essential to supporting current as well as future operations. The urgent need to address the steadily deteriorating condition of the aviation fleet and accelerate RC modernization is being addressed through an Aviation transformation plan. This plan:

- Accelerates AC and RC aviation modernization efforts
- Aligns aviation structure and resources to comply with Future Force requirements
- Accelerates divestiture of nonmodernized aircraft (AH-1, UH-1, OH-58D and OH-58A/C)
- Restructures and standardizes attack and lift formations across the force
- Adjusts RC stationing and alignment to mitigate near-term risk of reduced AC lift assets
- Leverages new training technologies to maintain crew proficiency
- Invests in improvements for aircraft reliability/maintainability
- Procures new UH-60Ms to accelerate fielding of utility aircraft to the Army National Guard (ARNG)
- Procures Light Utility Helicopters (LUHs) to divest aging UH-1s and OH-58A/Cs primarily found in the ARNG
- Converts an additional 96 AH-64As found in the ARNG to AH-64Ds
- Procures Armed Reconnaissance Helicopters (ARHs) to divest the OH-58KWs
- Procures the Future Cargo Aircraft (FCA) to replace an aging fixed-wing fleet

The last several years have seen great progress in modernizing Army aviation. Fielding of the AH-64D Longbow Apache is well underway. Recapitalization programs for the CH-47 Chinook and UH-60 Black Hawk have begun. The ARH will replace the OH-58D. Fixed wing is modernizing its current turbo-prop fleet (C-12 and RC-12) with the Global

Air Traffic Management system (GATM) as well as other safety and cockpit management systems, which will keep these aircraft relevant while the Army procures the FCA to replace legacy C-23 Sherpas. The Army is successfully retiring aging and obsolete aircraft from the force, and lessons learned from previous and current military operations and deployments are being addressed. The Army is continuing to examine the best means to achieve the vertical envelopment capability required to rapidly project the FCS-equipped forces across difficult or distant geographic locations. Future Force requirements for a robust, fully modernized aviation force are continuing to be developed.

### **Unmanned Aerial Vehicle Systems (UAVS)**

As the Army transforms to a more flexible, responsive and lethal Future Force, Army unmanned aerial vehicle systems (UAVS) will also transform to provide integrated, responsive and lethal capabilities to commanders at all echelons from the Current to Future Force. Future commanders will require a UAVS with a command and control capability that facilitates the flexible and rapid application of overmatching, decisive land power at specific times and locations throughout a greatly expanded battlespace. On battlefields of the future, UAVS will support all Army echelons, across the spectrum of conflict, on varied terrain and across the Battlefield Operating Systems. Redefining the Army's UAVS requirements reflects an evolutionary process to ensure the support required for tomorrow's Army while providing the best support possible to our forces engaged in the global war on terrorism.

In OEF and OIF, UAVS such as the Raven, Shadow 200, Hunter and Improved GNAT (I-GNAT) are providing a new dimension to ma-

maneuver forces. The Raven is being provided in theater to OEF and OIF units to enhance small unit reconnaissance, surveillance and target acquisition (RSTA). Equipping and training for deployed Raven units is conducted in theater and in CONUS. The Shadow 200, the Army's first tactical UAV (TUAV) to go into full-rate production (FRP), is also in use as it continues to be fielded to the military intelligence (MI) company within the Army's maneuver brigades, including the new Stryker brigades. Planned system improvements include airframe upgrades, refined target location error, and addition of a laser designation into the payload gimble.

The Hunter UAVS is fielded within III Corps aviation exploitation battalions, with one UAVS company per corps consisting of six air vehicles and associated payload and ground control stations. The Hunter is a RSTA and battle damage assessment (BDA) asset

providing ground forces with near real-time imagery via electro-optical/infrared (EO/IR) intelligence at ranges up to 200 km. The Hunter UAVS, while being used extensively as an ISR platform, has recently been upgraded to employ the Viper Strike munition in OIF. The Hunter UAVS capability will be sustained until an extended-range, multipurpose UAVS is fielded at the UE level as a RSTA and command, control, communications and intelligence (C3I) system.

Current UAVS modernization efforts focus on accelerating Shadow fielding and providing a small UAVS like the Raven to meet today's operational needs, accelerating Future Force UAVS development and fielding into the Current Force, continuing development of the ER/MP UAVS to replace the Hunter, and science and technology (S&T) efforts that leverage technologies for improved UAVS capabilities.

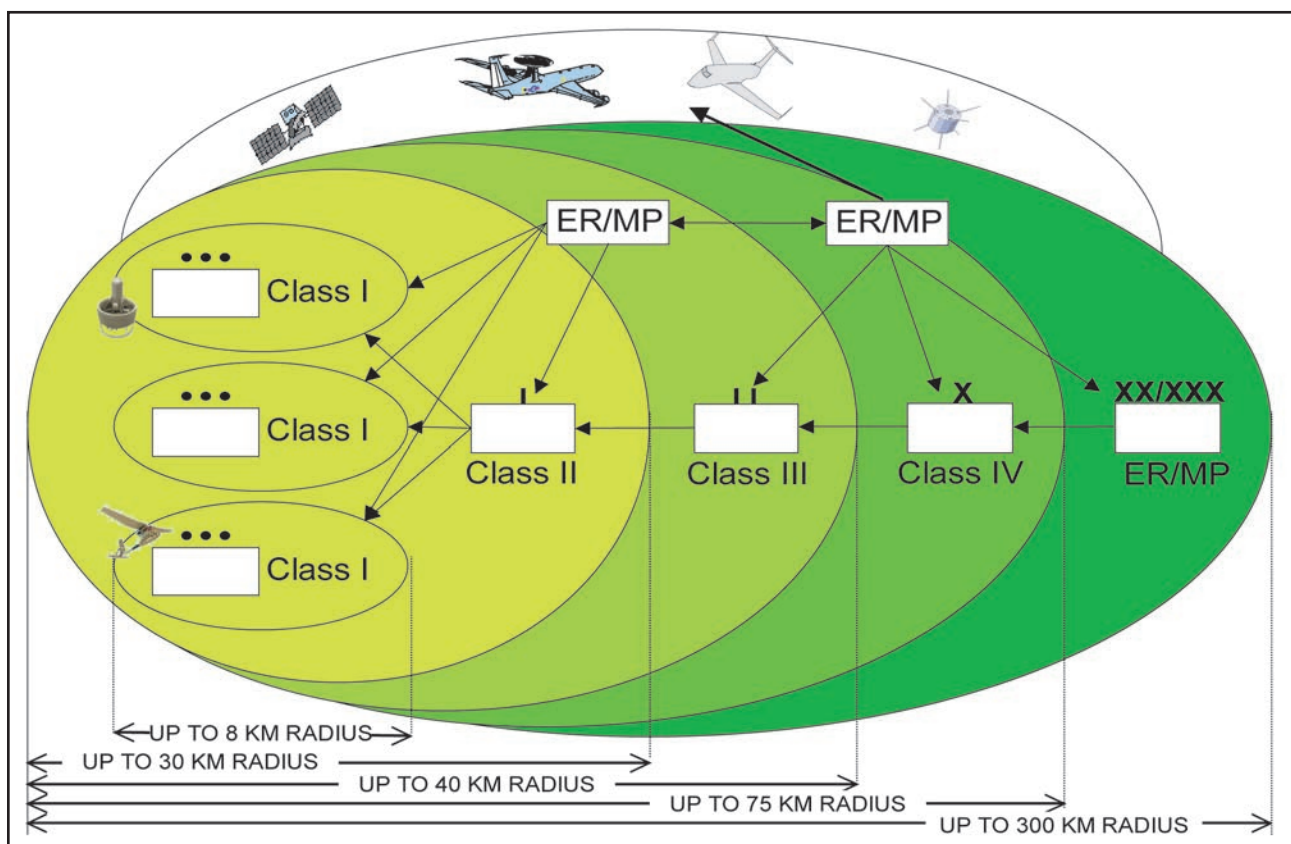


Figure D-4. UAVS Future Force Footprint

To prepare for the future operational environment, the Army is identifying the latest advances in relevant UAVS technology (airframes, payloads, payload management, as well as precision weapons delivery) and integrating these new capabilities into an architecture that is consistent with Army and DOD transformation. Extensive S&T work is also being conducted on vertical takeoff and landing UAVS to provide a hover-and-stare capability. The continued development and fielding of UAVS with advanced payloads is an important component of the Future Force's operational concept.

The Future Force will include an integrated family of UAVS that provide support from the platoon-level to the UE (Figure D-4). The FCS classes of UAVS will be fully integrated elements of the organic ISR capabilities. The FCS Classes I and II UAVS will provide the squad leader through the company commander the capability to see over the next terrain feature. The FCS Class III UAVS will enable a variety of combat functions such as precision fires, route reconnaissance and situational development at the battalion level. The FCS Class IV UAVS will serve as the UA's ISR workhorse to facilitate situational awareness, battle command, targeting support, lethal engagement, battle damage assessment (BDA) and force protection. The FCS lead system integrator recently selected the Northrop Grumman Fire Scout for development as the Class IV UAVS. While the path to the transformed Army of the future will focus on the Future Force, interoperability with fielded current systems will be maintained.

### Future Force Aviation

The Army envisions organizing aviation assets at all UE levels and at the maneuver brigade. Teaming UAVS with manned systems will enhance operational fires, maneuver

and intelligence collection capabilities for the commander. Future Force aviation modernization efforts incorporate lessons learned, the changing operational environment and emerging Joint Force requirements. These efforts leverage key technologies in areas such as electronics, UAVS interoperability, air platforms, propulsion systems and weaponization. These efforts include:

- Fielding FCS Classes I through IV UAVS, ER/MP and small unit UAVS
- Ensuring digital interoperability for effective joint/combined force operations
- Fielding effective, affordable systems that enhance aviation survivability and improve Soldier stamina
- Improving aircraft operational readiness
- Replacing obsolete air traffic services equipment and maintaining compliance with future airspace usage requirements
- Digitizing of aviation logistics and modernizing aviation ground support equipment
- Developing the technologies to ensure fielding of unmanned systems, interoperability of manned/unmanned aircraft, and next generation/future system development
- Leveraging technology to reduce costs, extend aircraft service life and improve training
- Replacing OH-58D aircraft with the ARH to correct numerous capability gaps (interoperability, survivability, agility, versatility, lethality, and sustainability)
- Procuring new UH-60M/HH-60M aircraft
- Replacing aging fixed-wing aircraft with the FCA

- Continual modernization of the AH-64D to a Block III configuration
- Replacing aging UH-1 and OH-58 aircraft with a new COTS LUH

Army aviation modernization will transform into a modular, capabilities-based maneuver arm with a reduced logistics tail optimized for the joint fight. The AC/RC organizations will be structured to meet Strategic Planning Guidance to provide tasked-based formations and improve RC aviation responsiveness to the swiftly defeat the enemy/win decisively strategies.

### Discussion of Key Aviation Materiel Programs

#### AH-64 Apache



**Description.** The AH-64 Apache is the Army's heavy attack helicopter for the Current and Future Forces. It is assigned to attack battalions and regimental aviation squadrons in both the AC and RC. Apache is a two-pilot, twin-engine attack helicopter designed to meet the Current Force mission requirements for reconnaissance and attack worldwide, day or night and under obscured battlefield and/or adverse weather conditions. It is a highly mobile and lethal aerial weapons platform with an array of armaments to destroy armor, personnel and materiel. The Apache has been in the Army inventory since 1986 and

an upgraded AH-64D Longbow began fielding in 1998. The AH-64D upgrades, among other improvements, adds a millimeter wave Fire Control Radar (FCR), Radar Frequency Interferometer (RFI), fire and forget radar-guided missile, and cockpit management and digitization enhancements. The combination of the FCR, RFI and the advanced navigation and avionics suite of the aircraft provides increased situational awareness, lethality and survivability. The Apache focused recapitalization program integrates a number of related initiatives to produce and/or retrofit aircraft across the Apache fleet to meet the objectives of the Army's recapitalization policy and to address lessons learned from recent combat operations and deployments. This program increases aircraft life by addressing high-maintenance demand/operating and support (O&S) cost drivers and incorporating a second generation forward looking infrared (FLIR) with the Modernized Target Acquisition Designation Sight/Pilot Night Vision Sensor (M-TADS/PNVS). The program goals are to reduce the overall average airframe age of the fleet to the half-life metric of 10 years by 2010, increase the unscheduled mean time between removal by 20 percent for selected recapitalized components, and maximize the return on recapped components by 20 percent.

**Program Status.** The recapitalization of 597 AH-64As to the AH-64D Longbow configuration will be complete in FY10. Multi-year I delivered 232 AH-64Ds through FY02. A second multi-year contract was signed in Oct 01 for an additional 269 AH-64Ds with deliveries through FY06. An additional 96 AH-64A model Apache conversions to the D model Longbow configuration will occur with inductions beginning in Jan 07 and deliveries in FY08 through FY10. Following this conversion, the Apache modernization plan continues in 3QFY10 with the initiation of the Block III Apache Longbow program. The

Block III Longbow will provide a net-ready capability that integrates the Apache into the Future Force. Fielding of the M-TADS to the total fleet will begin in FY05.

### **Armed Reconnaissance Helicopter (ARH)**

**Description.** As a result of analysis identifying existing capability gaps and subsequent Chief of Staff, U.S. Army (CSA) Aviation Focus Group decisions, in Feb 04 the CSA identified the need for 368 ARH aircraft. The ARH program was established to correct deficiencies in the OH-58D currently fulfilling the reconnaissance role.

The mission of the ARH is to provide a robust reconnaissance and security capability for the joint combined arms air-ground maneuver team. The ARH is a combination of a COTS airframe integrated with nondevelopmental mission equipment packages (MEPs). The ARH will be fielded to support the Current Force in the global war on terrorism and will possess the growth potential to bridge the capabilities gaps to the Future Force.

**Program Status.** A source selection implementing full and open competition will be the basis for selection of the Army's platform of choice, leading to a Milestone B decision in Jun 05. The System Development and Demonstration (SDD) planned efforts include integration of nondevelopmental item (NDI) subsystems onto an existing helicopter platform, developmental/operational testing and qualification to support the Milestone C low-rate initial production (LRIP) decision. An FRP decision review will be held in FY08.

### **Light Utility Helicopter (LUH)**

**Description.** The LUH will conduct light utility missions in support of specified Army tasks.

The specified Army tasks will be conducted as part of an integrated effort with other Services, government agencies, nongovernmental organizations and civil organizations. These missions include homeland security support operations, general support operations, generating force medical evacuation (MEDEVAC) operations, and support for Army training centers and test activities.

The LUH will replace the UH-1 and OH-58A/C aircraft. Additionally, introduction of this aircraft will return a number of UH-60s back to the warfighting force. The LUH will be a COTS aircraft that is less costly to procure and operate than the UH-60. It is being procured as a Federal Aviation Administration (FAA) certified aircraft with training and maintenance activities shared between the manufacturer and the military.

The LUH will primarily support the CONUS, Alaska, Hawaii, U.S. possessions and territories, as well as Europe; however, it is worldwide deployable to noncombat permissive environments, will be instrument flight rule (IFR) capable, and will operate in all geographical environments and conditions. The aircraft will be found in both active and ARNG units.

**Program Status.** The Initial Capabilities Document (ICD) was JROC-approved in Dec 04. The LUH program is currently staffing the Capability Development Document (CDD) for Joint Requirements Oversight Council (JROC) approval. The LUH program is scheduled for Milestone C decision in Sep 05.

### **UH-60 Black Hawk**

**Description.** The UH-60 is the Army's Current and Future Force utility and medical evacuation (MEDEVAC) helicopter. The UH-60 fleet is composed of 960 UH-60As, which



began production in 1977, and 638 UH-60Ls, which began production in 1989. Black Hawk can transport 11 fully equipped combat troops and external loads up to 8,000 pounds for the UH-60A and 9,000 pounds for the UH-60L. The UH-60 provides the force commander rapid and agile maneuver through air assault, general support, airborne C2 and MEDEVAC. It gives commanders the ability to initiate, conduct and sustain combat operations by providing internal and/or external lift of troops, weapon systems, supplies and equipment. In the airborne C2 role, it provides full joint and combined interoperability with other C4 and ISR elements to commanders at all echelons. The UH-60 is also heavily utilized in disaster relief operations, fire suppression, personnel recovery and VIP transport. The UH-60 is vital to the homeland security needs of our nation.

The Army will procure new UH-60M/HH-60M (MEDEVAC variant) in order to extend the fleet's lift/range capabilities, reduce O&S costs, improve transportability, enhance survivability, improve strategic transportability, integrate Air Warrior, digitize avionics and flight management systems that incorporate Global Air Traffic Management (GATM) requirements, and extend aircraft life. The UH-60M and HH-60M are expected to meet utility and MEDEVAC mission requirements through 2025.

**Program Status.** The UH-60M and HH-60M programs are currently in the SDD phase. The Milestone C decision is scheduled for the 2QFY05 with first unit equipped (FUE) in FY08. Initial fielding is scheduled to the special operations and AC divisions.

### **CH-47 Chinook**

**Description.** The CH-47 Chinook is a twin-turbine, tandem-rotor, heavy-lift transport helicopter with a useful load of up to 25,000 pounds. As the Army's only heavy lift helicop-



ter, its mission is to transport troops (including air assault), supplies, weapons and other cargo in general support operations. The CH-47 is vital to the homeland security needs of our nation. Secondary missions include medical evacuation, aircraft recovery, parachute drops, disaster relief, and search and rescue. These aircraft are fielded to heavy helicopter companies and special operations aviation. The CH-47F is expected to remain the Army's heavy lift helicopter until at least the 2020-25 time frame. The CH-47 recapitalization program will provide a more reliable, less costly to operate aircraft compatible with Army digital connectivity requirements with an extended aircraft life of approximately 20 years. Key modifications integrate a new machined airframe, an upgraded T55-GA-714A engine to restore performance capability, digital avionics, Air Warrior, Common Missile

Warning System (CMWS), emerging GATM requirements, enhanced air transportability, digital automatic flight control system (AFCS), and an Extended Range Fuel System II (ERFS II) for self-deployment missions. It will also incorporate reliability and maintainability improvements to include airframe tuning for vibration reduction, corrosion protection, digital source collector, and an automated maintenance program with 400-hour phase interval. Currently, there are 458 CH-47s in the inventory (421 CH-47s, 37 MH-47s). The recapitalization program rebuilds and upgrades all CH-47Ds and 61 special operations aviation MH-47s to the CH-47F/MH-47G configuration. In addition to recapitalization, a new build program will add new Chinooks to the inventory starting in FY06. These programs are funded to meet the Army's Aviation Transformation full requirement for Chinook aircraft.

**Program Status.** The CH-47F program received FRP approval on 22 Nov 04. Initial fielding is to the 160th SOAR (MH-47G) and the 101st AA Division (CH-47F).

### **Fixed-Wing**

**Description.** The Army fixed-wing program is composed of approximately 300 aircraft. Fixed-wing aircraft provide efficient, effective transportation during peacetime and wartime operations. Fixed-wing aircraft provide for rapid movement of personnel, critical mission equipment/supplies and special electronic mission aircraft (SEMA) intelligence support. SEMA collect, analyze and disseminate signal communications and imagery intelligence in support of wartime requirements for combatant commanders, field commanders and national intelligence assets. Fixed-wing aircraft are routinely utilized in disaster relief operations, air movement of personnel and critical supplies, civil support, counterdrug, security

assistance and homeland security missions. The Army modernization plan calls for FCA to replace aging C-23 aircraft within the current budget and potentially replace C-12 aircraft in the future.

FCA provides the Army with a self-deployable, 2,400-km cargo aircraft with an 18,000-pound payload capability that performs short takeoffs and landings. FCA will be the predominant Army fixed-wing aircraft with 128 airframes assigned to the RC. The Army is expected to procure 33 FCA (FY06-11) to rapidly move personnel and critical supplies across the battlefield.

**Program Status.** The Army is currently reviewing its fixed-wing requirements for the Future Force. The cornerstone of this review was the Jan 05 approval of the FCA ICD.

The Aerial Common Sensor (ACS) is being developed as the replacement for the SEMA RC-12 and RC-7 aircraft. The ACS airframe selection was completed in the spring of FY04 with four aircraft scheduled for fielding in FY09. The ACS is described in this annex at Appendix 4, Battlespace Awareness.

### **Hellfire Family of Missiles**

**Description.** Hellfire (HF) air-to-ground missiles are employed to destroy armored and high-value point targets. Semi-active laser (SAL) HF tracks laser energy delivered by ground or airborne designators while Longbow HF uses internal millimeter wave radar frequency (RF) for autonomous guidance. AH-64 Apache, ARH and OH-58D Kiowa Warrior utilize HF as their primary air-to-ground weapon for destruction of high-value point targets. The complementary precision point target engagement capability of the SAL HF and the fire-and-forget, adverse-weather capability of the RF HF provide the commander

with flexibility across a wide range of mission scenarios, permitting fast and decisive battle-field response.

**Program Status.** The Army will procure approximately 2,000 SAL HF for delivery in FY07 and FY08.

### **Advanced Precision Kill Weapon System (APKWS)**

**Description.** APKWS incorporates laser guidance into the 2.75" Hydra-70 rocket to provide a lower-cost, lighter-weight precision weapon capable of engaging non-armored to lightly armored targets and providing an alternative to HF against targets such as buildings, command posts, ADA sites and other targets not requiring the HF. The APKWS program provides accuracy and lethality improvements to the family of unguided rockets. The AH-64, OH-58D and ARH will use APKWS to significantly improve aircraft stowed kill capability in scenarios requiring area/suppressive fires or precision engagement against non-armored or lightly armored targets.

**Program Status.** APKWS has not yet begun production.

### **Discussion of Aviation Supporting Materiel Programs**

Aviation's supporting programs are essential to the support, sustainment and modernization/recapitalization of the aircraft programs discussed previously. These programs are essential to sustain and protect crews/aircraft, maintain interoperability with supported organizations, and field Future Force capabilities.

**Aircraft Survivability Equipment (ASE).** The Suite of Integrated Infrared Countermeasures (SIIRCM) will provide an enhanced

infrared countermeasure capability to aviation platforms. An advanced missile warning device with an improved countermeasure dispenser system and advanced flare munitions has been tested and is being installed onto selected platforms. Additionally, developmental efforts continue and will culminate with the acquisition of a multiband, solid-state laser jam head capable of defeating all known infrared threats. Aircraft undergoing recapitalization will have the required supporting wiring and hardware installed for the SIIRCM devices. The Army's RF-guided missile protection program was reinstated in the FY06-11 program plan and will employ the same acquisition strategy as the infrared program. The Army has also accelerated the fielding of critical equipment to enhance the Special Operations Forces (SOF) aircraft by equipping them with SIIRCM and the Army Suite of Integrated Radio Frequency Countermeasures (SIRFC). The Army believes that SOF modernization is among its highest equipping priorities, recognizing the critical role SOF plays on the joint team.

**Aviation Electronics (Avionics).** Avionics programs are designed to ensure aviation platforms meet combined arms and joint requirements for C2, mission planning, communications, navigation (to include worldwide civil airspace), information interchange and interoperability. Major avionics initiatives include fielding of the Joint Tactical Radio System (JTRS) in modernized aviation platforms, which will provide enhanced situational awareness, high-speed data and video exchange, and improvements in interoperability; migration of the Aviation Mission Planning Systems (AMPS) to a Joint Mission Planning System (JMPS), which will provide significant increases in mission-planning capabilities including a mission-rehearsal capability; new versions of the Improved Data Modem (IDM) as the centerpiece to digitization; Global Posi-

tioning System (GPS) equipment for improved weapons accuracy; and Global Air Traffic Management (GATM) equipment mandated when flying in civil airspace.

**Aircrew Integrated Systems (ACIS).** The ACIS program develops and fields equipment required to protect, sustain and enhance aircrew performance in sustained operations, on the ground, and during survival-evasion operations. Air Warrior is the primary ACIS program that provides integrated, modular life support equipment and chemical/biological protection, reduced weight/bulk, and significantly improved flight time in mission-oriented protective posture (MOPP) 4 gear. Air Warrior is described under the Discussion of Key Soldier Modernization Programs in this appendix.

**Air Traffic Services/Air Traffic Control (ATS/ATC).** ATS organizations must be specially equipped, highly trained, rapidly deployable on short notice, and capable of operating within the United States, international and combat airspace systems. They provide the full range of air traffic services from homeland security to major combat operations. Army ATS remains the core enabler for Army airspace C2, ensuring synchronized access of the increasingly congested joint airspace. ATS/ATC modernization fields smaller, lighter, more efficient, digitally connected terminal and en route communications and precision navigation systems for tactical and fixed base operations. Major programs include the Tactical Airspace Integration System (TAIS), the Air Traffic Navigation, Integration, and Coordination System (ATNAVICS), Mobile Tower System (MOTS), Joint Precision Approach Landing System (JPALS), and Global Air Traffic Management (GATM). JPALS and GATM are mandated by civilian air control authorities and joint Services to operate within 21st century airspace.

**Aviation Ground Support Equipment (AGSE).** To support and sustain full spectrum operations, aviation logistics must be as responsive and capable as the force it supports. To improve responsiveness, reduce vulnerability, and increase operational momentum, aviation must reduce the current in-theater aviation logistics footprint and digitize its logistics systems. The goal of AGSE modernization is to reduce logistical support requirements and improve aircraft operational readiness. Initiatives focus on improved automation and efficiency in three areas of development: modernization of test, measurement, and diagnostics equipment (TMDE); integration of seamless logistics management through automation systems; and replacement of aging ground support equipment.

**Aircraft Component Improvement Program (ACIP).** ACIP sustains engineering efforts to investigate, correct and qualify turbine engine and auxiliary power unit (APU) field-identified, safety critical and reliability deficiencies. ACIP inserts emerging technology, extends service life, drives down O&S costs and improves readiness by keeping engines operational and on wing. Return on investment is greater than 12:1 based on historical data using standard, approved costing models.

**Training Aids, Devices, Simulators and Simulations (TADSS).** TADSS modernization is critical to the combat effectiveness of our aircrews and maintainers, and in reducing operational costs. Aviation TADSS will leverage technology to provide effective and affordable combined arms/joint training and mission planning and rehearsal simulators that are current with the aircraft/systems they replicate. Simulator concurrency, fidelity, and combined arms tactical and mission rehearsal simulators/simulations that network virtual,

constructive and live simulation systems are major initiatives.

### **Army Aviation Summary**

Army aviation's modernization efforts are focused on fixing warfighting deficiencies (particularly those uncovered during recent operations), aligning the aviation force with the Army's Future Force concept, and fielding aircraft/subsystems required to achieve full-spectrum operational capability. Aviation modernization is being achieved through force structure changes, training initiatives, and materiel modernization (AH-64D, UH-60M/HH-60M, ARH, LUH, FCA, Apache Block III, CH-47F, UAVS, Air Warrior and other subsystem programs). Aviation is supported by S&T programs designed to provide the technology base required to upgrade existing aircraft and meet the challenges of new aircraft/weapon system developments. The Army's commitment to divesting currently obsolete aircraft and ensuring balanced modernization across both AC and RC is being realized. The Army continues to review near-term aviation funding issues to best align programs, create more executable strategies and identify acceptable risks that allow tailoring of program requirements.

### **Ground Force Capabilities**

Army ground maneuver forces with the capability to obtain a positional advantage and bring overwhelming combat power on the enemy with joint fires are essential to joint warfighting. Committed ground maneuver forces can rob an adversary of initiative and remove their freedom to continue hostilities. Sea, air and space dominance are invaluable, but only land dominance brings hostilities to a decisive conclusion—establishing and maintaining favorable security conditions for more comprehensive and enduring solutions to complex crises.

Our enemies seek sanctuary by hiding in protected facilities (mosques, churches and hospitals) to make it difficult for the commander who must discriminate among combatants and noncombatants. They create dug-in, camouflaged, concealed, hardened positions in caves or deep bunkers and mask these positions around innocent populations to avoid detection and attack by fires. With battlespace understanding and precision fires, Soldiers on the ground are often the only precise instrument that can locate, track and identify conflicted targets and attack them with lethal, accurate and timely effects using sensors linked to weapon delivery systems, Soldiers and decision makers.

The ground force's dominant maneuver and organic high-volume precision fires coupled with other joint precision fire capabilities for the close fight, will overwhelm the adversary, compelling him to flee his sanctuary or face battle to avoid defeat in detail. In either case, enemy dislocation, disintegration and destruction are inevitable through the combination of maneuver and fires enabled by ground force organic and joint ISR, and precision engagement capabilities.

Employing land force provides additional magnitudes of precision, perhaps impossible by other means, and is particularly effective in demonstrating national resolve. At ranges of just inches to strategic distances, the Soldier functions in the role of a sensor, decision maker, shooter and assessor.

The individual Soldier is the ultimate sensor. A Soldier observes, listens, feels and processes information. He analyzes, judges, thinks, prioritizes, decides and communicates what he knows and does so in real time. The Soldier is a shooter who designates, directs or calls for precision engagement. He does this from inches to the limit of his technology-enhanced

line-of-sight (LOS), in all weather conditions and terrain sets. Most importantly, he is disciplined and trained, understands purpose and intent, and can assess, first hand, the battle damage and the effects of precision engagement. In effect, the Soldier on the ground is the ultimate precision weapon.

On the asymmetrical, chaotic and nonlinear battlefield, the Soldier on the ground operates, and will continue to operate, as an indispensable part of the joint team. Today, operations in Afghanistan and Iraq reaffirm the Soldier's role as the centerpiece of our combat systems and formations. Soldiers enable persistent surveillance, reconnaissance and the right combination of maneuver, fires and information operations to achieve precision engagement. Soldiers bring the essential human dimension to warfighting dominance. They are the centerpiece of our systems and formations, now and in the future.

With the Soldier as our critical link to success, it is imperative to continuously develop Soldier systems that will enhance the Soldier's combat effectiveness. The Army's Soldier modernization program is a critical component to transforming today's Soldier into the Soldier envisioned in the Future Force.

### **Soldier Modernization**

Soldier modernization encompasses the integration of Soldier systems and equipment that consist of everything that is worn, carried or consumed for individual use in a tactical environment.

Soldier modernization uses the "Soldier as a system" concept. In this concept, the Soldier, analogous to a combat platform, has numerous component parts that must work in concert for full effectiveness. Yet, modernizing the Soldier is uniquely different from modernizing all other major weapon system

platforms in two significant respects. First, the Soldier system frame is human; its loss is not measurable in dollars. Second, the Soldier is the common element for all Army major weapon system platforms and the operation of every system is affected by the quality of the Soldier and the synergy created by his ability to interface effectively and efficiently with the equipment and systems.

The Land Warrior is a principal program under the Soldier as a system concept that includes a modular fighting system for Soldiers that integrates many components and technologies into a lethal, survivable, mobile and situationally aware Soldier system. The Army has successfully demonstrated the value of the Land Warrior system and is examining ways to accelerate its production and fielding.

The Soldier modernization process is accomplished through the use of one of three Soldier system development paths: the Soldier Enhancement Program (SEP), the Clothing and Individual Equipment (CIE) program, and the Warrior Programs (represented by Core Soldier, Mounted Warrior and Air Warrior). Also in development are the Combat Support (CS) and Combat Service Support (CSS) Soldier. The SEP requires minimal research, development, test and evaluation (RDTE) effort and shortens the developmental phase of the life-cycle process through the use of COTS items with a goal of three years to field to Soldiers. The CIE program encompasses all combat, life support, ballistic and environmental protection items worn or carried by the Soldiers for individual use that are not addressed by the SEP or Warrior programs. Central Funding and Fielding (CFF) is the procurement mechanism that acquires and fields SEP and CIE program life-support and mission-enhancing equipment for individual Soldiers.

**Rapid Fielding Initiative (RFI).** In an effort to accelerate Soldier system fielding to operational forces, the Army is utilizing the RFI that leverages COTS technology and current SEP/CIE programs. RFI focuses on enhancing several areas of Soldier equipment: lethality (includes enhanced optics, weapon rails, target locators and communications); force protection/mobility (includes advanced combat helmet, knee and elbow pads, military operations in urban terrain or MOUT kit); and Soldier mission essential equipment (includes enhanced clothing items, hydration system and modular sleeping system). The RFI was an unprogrammed requirement in FY04 funded with supplemental dollars. In FY06, the RFI funding strategy is a combination of programmed and supplemental funds to support procurement of RFI-designated items. The RFI campaign plan fields RFI to the operational Army by the end of FY07.

**Rapid Equipping Force (REF).** Many equipment items are being fielded simultaneously to operational forces that are not part of the RFI, but part of another related activity, the REF. The REF takes operational guidance from the Army G-3, reports to the Vice Chief of Staff Army (VCSA), and works directly with the operational commanders to find solutions to identified operational requirements. These solutions may result in the redistribution of existing Army materiel assets, accelerated procurement of new or existing military/commercial materiel equipment, redirected fielding plans, and initiating development of a future materiel solution. Soldier protection has been a major focus area for both RFI and REF fielding activities in support of OEF and OIF. REF solutions include interceptor body armor (IBA), body armor set individual countermeasure (BASIC) body armor, Thermal Weapon Sights (TWS), night vision goggles

Area	Where We Were a Year Ago...	Where We Are Today!
Soldier body armor	Fielded 100,000 sets of body armor	Fielded 500,000 sets of body armor
Up-armored HMMWVs (UAH)	Fielded more than 1,900 OEF/OIF HMMWVs	Provided over 6,000 UAHs to theater. Current validated requirement for add-on armor (AoA) kits for HMMWV is 13,872. Produced over 10,000 AoA kits and installed over 9,500.
State-of-the-art Soldier equipment "RFI"	Partially fielded 8 BCTs OEF/OIF 3% operational Army fielded	Fielded 36 BCTs OEF/OIF 30% operational Army fielded
Bradley-BRAT	300 sets delivered 60 sets on contract	592 sets delivered. OIF requirement fully funded, executing plan to meet theater requirement in Sep 05
Stryker SLAT	2 SBCT sets funded 1 set in OIF, 1 in production	3 SBCT sets funded. 3rd set to be completed Apr 05
Stryker add-on armor (reactive armor)	In development and testing	Pending production decision. 1st SBCT(T) scheduled for completion in Jun 06
Counter IED Device	Aircraft Survivability Equipment (ASE)	Total of 2,334 Warlock systems fielded
Tactical and Small Unmanned Aerial Vehicle Systems (UAVS)	Total of 14 systems fielded	Total of 32 systems fielded
Aircraft Survivability Equipment (ASE)	Aircraft equipped w/legacy systems. Army reviewed threat/requirements and developed an Accelerated Fielding Plan for next generation ASE equipment.	Installation of CMWS/ICMD commenced Nov 04. Currently have 13 systems on CH-47s, 50 on UH-60s, and 3 on C-12s. Installations are ongoing in support of OIF/OEF. Goal is to upgrade 3,000+ Army aircraft.

Figure D-5. Protecting Army Forces



(NVGs), up-armored HMMWVs, SLAT armor, and commercial solutions like the Well-Cam and PackBots. The Well-Cam is a webcam attached to an Ethernet cable and a laptop to allow Soldiers in OEF to search wells for weapon caches. PackBots are commercially produced robots used to clear caves, buildings and compounds.

**Force Protection.** The REF and RFI, as well as other efforts that accelerate equipment to operational forces, are critical to enhancing our Soldiers' combat effectiveness and protection. In Iraq, the widespread use of improvised explosive devices (IEDs) by enemy forces has created the need to immediately provide additional force protection capabilities that include add-on armor kits for tactical wheeled vehicles such as the HMMWV, HEMTT, Palletized Load System (PLS) and FMTVs. Crew protection kits, which are integrated into the vehicle design, like the Up-Armored HMMWV, currently offer the best solution. The Army is pursuing the procurement and fielding of kits that provide steel doors with windows, back plate and steel plates for lower perimeter of the vehicle and ballistic windshields that provided the highest level of protection while maintaining equipment payload requirements for these vehicles. The add-on armor kit is currently funded for 10,416 HMMWVs, 1,080 HEMTTs, 1,150 FMTVs, 871 PLSs, 599 HET kits, 484 M915 line haul truck tractor kits and 926 M900-series 5-ton kits. The Army continues to pursue add-on armor kits for all families of tactical wheeled vehicles.

**EOD Family of Systems.** Another area of emphasis to enhance Soldier protection is the family of systems available to Soldiers in the Army's explosive ordnance detachment (EOD) units. These systems are critical to homeland security, force protection and support of the global war on terrorism. They provide EOD Soldiers at home and abroad with the capability to examine, identify and render safe ordnance effectively and safely. Lessons learned from OEF and OIF have increased the awareness and priority of EOD systems. Future acquisitions will include the Noninvasive Filler Identification (NFI) system, the Man-Transportable Robotic System (MTRS), and the Large IED Countermeasures Family of Systems. Each acquisition will be a modified commercial buy. NFI and large IED countermeasures are new critical capabilities; MTRS will provide an improved capability.

**Combat Identification (CID).** CID measures are another means to enhance Soldier protection. As a result of past CID efforts and lessons learned during Operation Desert Storm (ODS), significant efforts have been made to reduce fratricide with improved CID measures. In OEF and OIF, the widespread use of GPS systems and Blue Force Tracking (BFT) systems such as FBCB2 have proven to significantly reduce fratricide incidents through an improved capability in locating and identifying friendly forces on the battlefield. These systems and other CID measures are critical today in the fast-paced, nonlinear, distributed, simultaneous offensive-oriented battlefield environment.

In FY02, due to affordability issues, the Army terminated the Battlefield Combat Identification System (BCIS) designed to improve Current Force CID capabilities. The millimeter wave technology being developed under this program was transferred to Future Force development efforts. In an effort to reinstate a CID program, the G-3/G-8 have established a CID Overarching Integrated Process Team (OIPT) to update the strategy and concept for proceeding forward with a DOTMLPF integrated CID program that leverages advanced technology. This OIPT will provide an updated and approved CID concept and strategy; a CID action plan for the Current and Future Forces in a JIM environment, and a funding strategy to support a CID program in the FY06-11 FYDP. An Analysis of Alternatives (AOA) will be used to develop investment strategies properly focused on mission, task and purpose to meet joint warfighter requirements. Additionally, the Army Science Board will conduct an ad hoc study to assist the Army staff in their review and synchronization of CID efforts.

The Army's RFI, REF, EOD, CID and a host of other equipping efforts are challenging exist-



ing assumptions and processes to demonstrate a commitment to equipping Soldiers with the best equipment available and providing relevant and ready forces to the combatant commanders.

We are an Army at war and will meet the current demands while always changing to meet future challenges.

## Discussion of Key Soldier Modernization Programs

### **Soldier as a System (SaaS)**

**Description.** The SaaS provides a common architecture and framework across all Soldier domains (ground, mounted, air and core Soldier) that enables development and fielding of a common Soldier system platform and modular components which can be configured/reconfigured as required to suit all Soldier specialities. The SAAS concept provides common interfaces for Soldier communications with Future Force platforms and other SaaS equipment to enable total Soldier integration and compatibility with other Soldiers, fires and platforms. Each SaaS domain is described below with its associated modernization programs.

### **Ground Soldier System (GSS)**

**Description.** The GSS is a modular, integrated fighting system for ground combatant Soldiers that integrates many components and technologies into a lethal, survivable, mobile and more situationally aware Soldier system. Land Warrior (LW) systems/components include multifunctional laser with digital compass, video camera and close combat optic; integrated headgear with helmet-mounted display and image intensifier; enhancements to protective clothing and individual equipment; and integrated individual Soldier computer/radio/GPS. The systems approach optimizes and integrates these capabilities, to include interface with the Army Tactical Internet, without adding to the Soldier's combat load or logistical footprint. S&T advances in warfighting concepts, SoS architectures, and technology components in areas such as enhanced navigation, system voice control, weight reduction, digital connectivity and power are being pursued through the Future

Force Warrior (FFW) Advanced Technology Demonstration (ATD) and will be inserted over time as the technology matures to meet LW objective requirements. The FFWATD is also charged with developing an analysis-of-variants system design concept that will enable expansion of the FFW concept to the other Soldier variants. This concept will contain design hooks and interfaces common to all Soldiers, providing a tailorable and reconfigurable system-of-systems design extensible to all Soldiers.

**Program Status.** The LW Block II (Stryker interoperable) program has been restructured to accommodate redefined Current Force requirements. The Army will field, from FY05-10, the Commander Digital Assistant (CDA) to all SBCTs, four light divisions (82nd, 101st, 10th, 25th), and two heavy divisions (4th ID, 1st CD) at a cost of \$379 million. Three variants of CDA will be fielded: a company commander variant, a platoon leader/sergeant variant, and a squad/team leader variant. Continued CDA developments are planned. The program is now focusing on the development of the Ground Soldier System (Land Warrior Block III) system in alignment with the FCS UA. GSS will be fielded to the Future Force. Throughout the LW development, the Army will seek opportunities to field mature capabilities to the force early before the fully integrated LW system is available for fielding.

### **Mounted Warrior (MW)**

**Description.** The MW Soldier Systems (MWSS) encompasses all CIE required for use by combat vehicle crewmen (CVC) in eight functional areas: armor, artillery, air defense, mounted infantry, chemical, military police, ordnance and combat medics. The MWSS ensemble includes the CVC helmet, flame protective uniform, cordless communi-

cations, heads-up display (for vehicle commanders), and eye protection.

**Program Status.** The Army Requirements Oversight Committee (AROC) approved the ORD in Apr 04. The FUE is required in FY12 in alignment with fielding of the FCS UA.

### **Air Warrior (AW)**



**Description.** AW is a Soldier system for helicopter crewmen that provides a new generation of integrated, mission-tailorable, combat-effective life support equipment and chemical/biological protection with reduced weight/bulk designed to improve aircrew endurance, mobility and performance. AW significantly improves flight time in MOPP 4 gear from 1.6 to

5.3 hours. Air Warrior systems/components include:

- Microclimate cooling system (MCS) that includes a microclimate cooling garment (MCG) and a small microclimate cooling unit that chills water and pumps it through small tubes embedded in the MCG
- Survival equipment subsystem that includes a survival gear carrier, soft and hard body armor, thigh holster and survival knife in ankle sheath
- Interim Modular Integrated Helmet Display System (MIHDS) with laser eye protection and a night vision device mount
- Over-water survival subsystem that includes a personal flotation device, survival egress air (breathing oxygen), and an

inflatable raft (LRU-18U) that is integrated into the ensemble and worn by the crew member

- NBC protection with a modified chemical protective undergarment, M45 or M48 protective mask with blower unit, gloves and overboots
- Aviation clothing items that include modified aircrew BDU and the Aircrew Cold Weather Garment System

Future AW system spiral development improvements focus on the technology insertion of improved and/or enhanced components reflecting emerging technologies defined in AW Blocks 2 and 3.

Block 2 developmental efforts are underway and will add an Aircraft Wireless Intercom System (AWIS) and the Electronic Data Manager (EDM). The AWIS will enhance crew member performance by providing the capability for wireless communications within the aircrew and with ground crew or ramp support personnel such as in a tactical forward area rearm and refueling point (FARRP). The EDM, in the form of a digital kneeboard, will provide a capability to the aircrew to generate, store, display and distribute digital information and will interface with BFT systems.

Block 3 efforts will increase performance and capabilities by adding a fully compliant MIHDS helmet. The MIHDS helmet will provide, as a baseline, the same safety performance characteristics as the HGU-56/P helmet (impact, sound attenuation, retention, etc.). The MIHDS will be tailorable and compatible with the Apache helmet-mounted displays and head tracking technologies and will also provide an improved day/night helmet-mounted display symbology for those aircraft that currently lack this feature. These helmet-mounted displays will be compatible with aircrew

prescription spectacles, chemical/biological (CB) protection, oxygen masks and laser eye protective technologies. CB protection will be donned in flight without removing the helmet. MIHDS will provide the user complete laser eye protection in the visible through the near infrared portion (400 to 1,400 nanometers) of the spectrum and will also provide nuclear flash protection.

**Program Status.** AW Block 1 production began in FY03 and fielding began in 2QFY04 to the 160th SOAR(A). Block 2 development began in FY02, and Block 3 development began in FY04.

### **Enhanced Night Vision Goggles (ENVG)**

**Description.** The next generation of night vision goggles for the Soldier is the ENVG. It combines both an uncooled thermal and an image-intensification (I2) capability into a single device. The ENVG provides Soldiers with the ability to engage and execute close combat in all levels of light, to include the zero illumination conditions found in caves and underground environments, adverse weather conditions and under battlefield obscurant conditions. This is a system component of the Soldier Warrior programs.



**Program Status.** This program is in concept and technology development phase with a Milestone B decision in early FY04. The Milestone C decision is scheduled in late FY05 with production beginning in FY06.

### **Thermal Weapon Sights (TWS)**

**Description.** Thermal Weapon Sights are a family of low-cost, lightweight, man-portable IR imaging devices of high resolution to be

used for surveillance and fire control of individual and crew served weapons during both daylight and darkness. TWS operate in adverse weather and dirty battlefield scenarios including light foliage, smoke, dust and camouflage, and will be fielded to Current and Future Forces as a component of the LW program.



**Program Status.** Medium and heavy TWSs were fielded to the Special Operations Forces, 101st Airborne Division, 82nd Airborne Division and the 3rd Infantry Division in support of OEF and OIF and has contributed significantly to Soldier survivability and lethality. Light TWS was fielded to the Rangers in 4QFY04 and is now being fielded to other special operations forces.

### **Objective Individual Combat Weapon (OICW) Increment 1**

**Description.** The OICW Increment 1 builds on the flexibility of the existing Modular Weapon System (MWS). It sets the stage for future scalable, modular effects that allow the tactical commander to tailor the capability and weight to meet the needs of any operation. It will be the foundation for a family of small arms that features commonality of parts, interface, and updated training that more closely matches tactical reality. Variants of the OICW (carbine, special compact (SC), designated marksman (DM) and light machine gun (LMG)) will fill a variety of roles throughout the Current and Future Forces and the U.S. military at large. The OICW Increment I will replace the M16/M4 family of small arms and other weapon requirements (M203 grenade launcher, M249 squad automatic weapon (SAW) and selected M9 pistols) throughout the U.S. Army. Other

U.S. Armed Services or government agencies may adopt it to suit their needs.

Subsequent increments (Increments II and III) will include new and advanced technologies that will enable the development and fielding of lighter weight and improved ammunitions, nonlethal munitions, precision high-explosive airburst (HEAB) munitions systems, embedded training and simulators, lighter-weight direct-view sights, improved multifunctional lasers, micro electro-mechanical systems, nano-explosives, maneuverable projectiles, advanced shaped-charge designs, electronic fusing and improved materials that will increase operational readiness and effectiveness as well as reduce total life-cycle costs. The OICW Increment 1 will be compatible with the digital battlefield and will provide the lethality upgrade for the LW program. The Army is still completing capabilities documentation for this system.

**Program Status.** The OICW Increment 1 is a major system acquisition program (ACAT II) in the SDD phase with a Milestone C decision scheduled in 4QFY05 and FUE in FY06.

### **XM307 Objective Crew Served Weapon (OCSW)**

**Description.** XM307 is a close combat support weapon that will enable platforms to



quickly react with a high-volume fire against troops in the open and lightly armored vehicles. The XM307 will provide 360-degree engagement out to 800 meters under day/night and adverse weather conditions while stationary and on the move at elevations from -20 degrees to +60 degrees. The XM307 fired

remotely and by the crew from a protected position will fire high-explosive airburst, armor-piercing, kinetic energy, thermobaric and nonlethal ammunition from a common magazine, selectable by the crew. This weapon will have an automatic ammunition loading system with a manual backup to allow ammunition to be fed from the right or left side of the weapon and provide self or remote correction of malfunction. It will contain a test and evaluation (T&E) mechanism capable of providing rapid target acquisition. The XM307 weighs approximately 50.3 pounds and is capable of firing 25 mm air-bursting munitions designed to defeat defilade targets out to 1,000 meters and suppress area targets out to 2,000 meters. It includes a full-solution fire control that includes direct-view optics; full-solution ballistic calculation; digital range finder; CCD video; tracker module; digital compass; environmental sensors as well as many other options. It is being considered to replace selected M2 and MK19 grenade machine guns. The Army is still conducting mission analysis and completing capabilities documentation for this system.

**Program Status.** The XM307 program transitioned from the tech base in FY04. The Milestone C decision is scheduled in FY07.

#### **Lightweight Laser Designator Range Finder (LLDR)**

**Description.** The LLDR is a man-portable, modular, target location and laser designation system. The system consists of a target locator module (TLM) and a laser designator module (LDM). LLDR provides Soldiers with a man-portable capability to observe and accurately locate targets, digitally transmit target location data to the tactical network, and laser-designate high-priority targets for destruction by precision munitions. LLDR greatly

increases the ability to recognize targets at night and under battlefield conditions.

**Program Status.** LLDR is currently funded for 371 systems for procurement and fielding to Army units. The 25th ID received 21 LLDRs for their Operations Iraqi Freedom and Enduring Freedom (OIF and OEF) deployments and the 3rd ID received 20 systems in FY04.

#### **Nonlethal Capabilities Set (NLCS)**

**Description.** Nonlethal capabilities provide commanders options when confronting situations in which the use of deadly force is not the preferred response. NLCS provide flexibility by allowing forces to apply measured force with reduced risk of serious noncombatant casualties, but in a manner that provides force protection and effects compliance—ensuring the success of the military mission.

The NLCS can be rapidly deployed by military transport or commercial carrier. NLCS consists of six categories: counterpersonnel systems, countermateriel systems, protective equipment, enhancement devices, training devices/allocations and support equipment.

**Program Status.** NLCS is currently being fielded to units supporting and preparing to support OIF/OEF operations. Follow-on fielding is scheduled to begin in FY06.

#### **Ground Force Modernization**

Annex B, Organization, of the *2005 Army Modernization Plan* provides details on the Army's two primary ground force modernization efforts, the accelerated development and fielding of six SBCTs from 2001 to 2008 and the development and initial fielding of a UA maneuver brigade equipped with FCS from 2005 to 2014 to bring Future Force capabilities into the Current Force. The USF process

will field these units with capabilities achieved from a complete set of unit equipment. Under the SoS approach, the unit must demonstrate the ability to operate interdependent systems together to achieve an IOC for the unit. In FY03, the first SBCT completed fielding and operational testing to achieve IOC. It has since been deployed in support of OIF.

### **Stryker Brigade Combat Team (SBCT).**

The SBCT is inherently a precision unit. The force design of the SBCT provides the Army with dominant maneuver and precision engagement capabilities not found in any other Army brigade-sized unit. Specifically, the RSTA squadron, equipped with TUAVs and ground-based HUMINT specialists, provide the commander with unequalled situational understanding. The networked command and control architecture that features FBCB2, allows the commander to provide the same picture to lower echelons and major combat platforms, such as the Stryker vehicle, thereby establishing a real-time friendly force operational picture for the unit. The SBCT



also features organic, ground-based sniper teams—the essence of precision strike and a critical combat requirement that has once again been validated during the ongoing war against terrorism.

The SBCT's force application capability is truly global. C-130 transportable, the unit can rapidly deploy to austere environments,

thereby overcoming enemy area-denial and anti-access efforts, and can quickly mount offensive operations with minimal reception, staging and integration. Although it excels in the midpoint of the operational spectrum, it can fight effectively as a fully committed unit in major engagement and battles with augmentation (such as attack aviation and/or rocket artillery). With its superior tactical mobility and excellent battlefield situational awareness, the SBCT can also execute difficult security missions such as guard, cover, screen, counterreconnaissance and rear-area combat operations. The superior off-road maneuverability of the Stryker vehicle, combined with its dismounted infantry assault capability featuring robust antitank weaponry, ensures the SBCT can very effectively engage and destroy enemy armor in close, complex and/or urban terrain.

The Army is currently benefiting from the capability of the SBCT in OIF. The unit is maximizing the capabilities of this transformational organization in combat operations. Examples are increased speed (60+ miles per hour) and survivability (protection against rocket-propelled grenades (RPGs) and IEDs) provided by the Stryker family of vehicles in the brigade; near-seamless situational awareness down to the combat vehicle crew level allowing quick execution of changing missions; high rate of reliability of the Stryker vehicles; and high confidence in the vehicle and its capabilities by the Soldiers in the brigade.

The capabilities of the SBCTs will be operationally enhanced when the remaining two variants, the Mobile Gun System (MGS) and the NBC Reconnaissance Vehicle (NBCRV) are fielded in FY07 and FY08. The MGS provides rapid and lethal direct fire to support assaulting infantry and the NBCRV provides NBC situational awareness to increase the combat power of the BCT.

The Army is exploring alternatives in the upcoming program years that will further enhance the SBCTs' ability to track, surveil, and ultimately engage and destroy targets. Among the systems being examined are precision mortars, advanced artillery munitions such as Excalibur, and initiatives designed to further enhance the SBCTs' situational awareness and effectiveness: Joint Tactical Radio System (JTRS) to provide joint inter-connectivity command post level, Secure Mobile Anti-Jam Reliable Tactical Terminal (SMART-T)—a beyond-line-of-sight (BLOS) communications system; mounted mast sensor improvements for the FSV and RV; Lightweight 155 mm Howitzer (LW 155)—a lighter automated towed howitzer system with greater survivability, lethality, range, precision and strategic deployability; Warfighter Information Network-Tactical (WIN-T); and the Distributed Common Ground System-Army (DCGS-A).

**Future Force Development.** The Future Force concept embodies precise and dominant maneuver coupled with precision engagement through a combination of maneuver, fires and information dominance. As an offensive-oriented force, it conducts operational maneuver from strategic distances executing synchronized, distributed operations as part of a Joint Force to destroy key enemy capabilities in a distributed, non-linear battlespace. It provides seamless C4 and ISR, FCS, integrated sensors, attack and reconnaissance helicopters, expanded maneuver and fires with standoff, LOS and non-line-of-sight (NLOS) capabilities. These attributes enable the Joint Force to achieve total disintegration, dislocation and destruction of enemy forces from tactical through operational levels. Direct lethal action will contribute to the following joint efforts:

- Destroy and degrade enemy anti-access systems such as long-range missiles and artillery, unconventional forces, enemy surveillance and targeting capabilities
- Participate in the destruction of enemy precision engagement systems. This represents a key task, given the significant threat that enemy systems represent to Joint Force freedom of action and maneuver
- Seize key terrain and facilities required to support force flow and decisive operations, extension of the area of influence, and isolation of enemy forces
- Degrade key enemy capabilities (C4, ISR, and logistical structures) essential to enemy offensive operations
- Provide essential C4, ISR and logistical support to the Joint Force
- Support the joint force commander's information operations to gain momentum superiority

**FCS-Equipped Unit of Action (UA) Maneuver Brigade.** Although the Army has not finalized a complete Future Force design, it has approved an organizational and operational (O&O) plan for a UA maneuver brigade equipped with FCS.

This UA's organizational design includes UAVS at each echelon to enhance the organization's RSTA capability. This capability is viewed as essential to the success of UA operations to build and maintain situational awareness and understanding before, during and after tactical operations. An aviation squadron within the UA will integrate with UAVS to provide a robust reconnaissance capability with manned and unmanned aviation (man-in-the-loop) in support of the brigade mission. Additionally, they will engage to destroy high-payoff

or most dangerous target sets with organic weapons or by employing external networked fires under brigade control.

The NLOS battalion is the UA's primary provider of destructive, suppressive, protective and special purpose fires that enable the UA to conduct decisive operations. It is envisioned that the NLOS Cannon will provide accurate, reliable, responsive, on-demand, 24-hour, all-weather, all-terrain and close-supporting fires with a wide array of precision and nonprecision munitions. The NLOS Launcher System provides a networked system of missile launchers with command and control systems that will provide both precision and loitering attack munitions. NLOS mortars (organic to the UA combined arms battalion) will also provide supporting fires to the UA. The combination of NLOS mortar, cannon, and launcher systems in the UA and HIMARS in the UE will provide the future commander with a greatly increased precision and lethal capability.

## Discussion of Key Ground Force Materiel Programs

### Abrams Tank



**Description.** The Abrams tank modernization strategy supports the Army Campaign Plan by providing the Abrams tank the lethality, survivability and fightability necessary to

defeat advanced threats well into the future. The Abrams tank closes with and destroys enemy forces on the integrated battlefield using mobility, firepower and shock effect. The 120 mm main gun on the M1A1 and M1A2 Family of Vehicles, combined with the powerful 1,500-hp turbine engine and special armor, make the Abrams tank particularly suitable for attacking or defending against large concentrations of heavy armor forces on a highly lethal battlefield, as well as in support of the global war on terrorism. The Abrams recapitalization program is a modernization program focused on the current armored force and seeks to ensure the Abrams main battle tank remains relevant to the developing Future Force until fully replaced by the MGS variant of the FCS by maintaining combat overmatch.

The Army has a recapitalization procurement and modernization strategy under the Abrams Integrated Management (AIM) Program that provides M1A1 tanks with rebuilt AGT1500 engines and improvements to selected tank subsystems that bring the tanks to a zero-hours/-miles rebuild condition. The AIM Program provides selected technology insertions designed to extend the service life of the fleet while reducing O&S costs. Some of these improvements include revised hull and turret network boxes, a digital electronics control unit, a driver's hatch interlock sensor system, an upgraded tank commander's panel, an eye-safe laser range finder, a pulse jet air system, and a battlefield override (mechanical fuel and transmission bypass) system. A development and integration effort leading to the insertion of a single second-generation thermal sensor in the gunner's primary sight is currently underway.

The M1A2 SEP program began in FY99 and selectively upgrades M1 tanks or retrofits M1A2 tanks with rebuilt critical components

that bring the tanks to a near zero-hours/-miles condition. M1A2 SEP tanks have a second generation FLIR sensor in the commander's independent thermal viewer (CITV) to enhance target acquisition and significantly improve lethality, hardware and software that supports Army digitization and the FBCB2 system, digital diagnostics system that enhances tank maintenance and sustainment, thermal management system that reduces the tank's battlefield signature, and an improved armor system that improves survivability against emerging threats.

The Abrams modernization strategy also includes a major improvement program for the current AGT1500 engine coined the Total Integrated Engine Revitalization (TIGER) Program. This effort serves to execute an integrated program that will sustain the AGT1500 engine for the benefit of the entire Abrams tank fleet with an average mean time between depot replacement (MTBDR) of at least 1,400 hours. The TIGER Program establishes a single standard for overhauled engines, addresses current readiness issues, improves durability, reduces O&S costs, and implements automated data collection in support of fact-based maintenance decisions. The development of the TIGER Program will continue through FY05, with procurement beginning in FY06.

**Program Status.** The Army completed fielding of M1A2 SEP tanks to the 1st Cavalry Division and is scheduled to complete fielding to the 4th Infantry Division in FY05. Efforts are underway to field M1A2 SEP tanks to the 3rd Armored Cavalry Regiment beginning in FY07 and two squadrons to the 11th Armored Cavalry Regiment beginning in FY09. Currently, the Army is projected to procure 803 M1A2 SEP tanks.

The Army completed fielding M1A1 AIMs to 2nd Infantry Division and the 1st Armored and 1st Infantry brigades in Europe. The next units to be fielded are the brigades of the 1st Armored and 1st Infantry Divisions at Fort Riley, the Army prepositioned stock (APS) and the 3rd Infantry Division beginning in FY07. Currently, the Army is projected to procure a total of 1050 AIM tanks. Modernization of the ARNG continues through cascading of M1A1 HA tanks from the AC.

### **Bradley Fighting Vehicle**

**Description.** The Bradley recapitalization program rebuilds and upgrades M2/M3A2s to the most modernized M2/M3A3 configuration. The A3 adds two second generation forward looking infrared (2GF) devices (one in the commander's independent viewer (CIV) and one in the improved Bradley acquisition sight (IBAS)), a position/navigation (POS/NAV) system, core electronic architecture, and digital C2. These upgrades improve the crew's ability to navigate, pinpoint and identify friendly and enemy positions, and engage two separate targets nearly simultaneously in both day and night conditions. Also, the digital C2 provides a near real-time integrated data link between the M2A3 and other combat vehicles and headquarters.



**Program Status.** The 1st Cavalry Division and 4th Infantry Division will be fielded with 408 M2A3 Bradleys. The 3rd ACR will be

fielded with 131 OIF recapitalized Bradley Cavalry/Scout vehicles (M3A2 OIF configuration) containing FBCB2, the IBAS and a ballistic fire control system. Selected III Corps engineer battalions will be fielded with 342 converted M3A2 ODS-D vehicles. These digitized vehicles will vastly improve the lethality, survivability and situational awareness for the engineers and supported units. Further digitization to the active fleet will be determined as the Army builds the FY06-11 program plan.

### **Stryker Family of Armored Vehicles**



**Description.** The Stryker Family of Armored Vehicles is the centerpiece combat and combat support platform for the SBCTs. Two variants of the Stryker will be fielded: the Mobile Gun System (MGS) and the Infantry Carrier Vehicle (ICV). There will be eight additional configurations of the ICV: Reconnaissance Vehicle (RV), Mortar Carrier (MC), Commander Vehicle (CV), Fire Support Vehicle (FSV), Engineer Squad Vehicle (ESV), Medical Evacuation Vehicle (MEV), Antitank Guided Missile Vehicle (ATGM), and Nuclear, Biological and Chemical Reconnaissance Vehicle (NBCRV). Stryker capabilities include:

- Strategically responsive and deployable on the complete U.S. Air Force (USAF) family of aircraft
- Roll-on/roll-off combat capable with minimum preparation
- Superior situational awareness with inter-netted/networked communications

- Survivability enhanced by all-around 14.5 mm armor piercing and 152 mm artillery airburst protection (add-on armor provides protection against RPG antitank weapons)
- Accurate target acquisition with Long-Range Advanced Scout Surveillance System (LRAS3) mission package
- Accurate target engagement with Remote Weapon Station (MK 19 grenade launcher and/or M2 .50 caliber machine gun)
- Decisive offensive action with dismounted infantry assault (ICV)
- Bunker-busting capability with 105 mm cannon (MGS) for roles in immediate fire support of dismounted infantry operations and with TOW bunker-buster munitions (ATGM)
- Responsive indirect fires with 120 mm dismounted mortar (MC)
- Antitank capability with TOW 2B (ATGM) and Javelin-equipped dismounted infantry (ICV)
- Mobility enhanced by mine plow, roller and detector (ESV)
- Integrated NBC sensor capability (NBCRV)

The Stryker provides a unique family-of-systems approach that maximizes commonality and integrated capabilities while filling an immediate capabilities gap in the Current Force. Supporting Stryker fielding is a complete new home station equipment training package for both operators and maintainers.

**Program Status.** Planned procurement is for 2,444 vehicles consisting of two variants: ICV and MGS. The Stryker program obtained an FRP decision on seven of the 10 variants

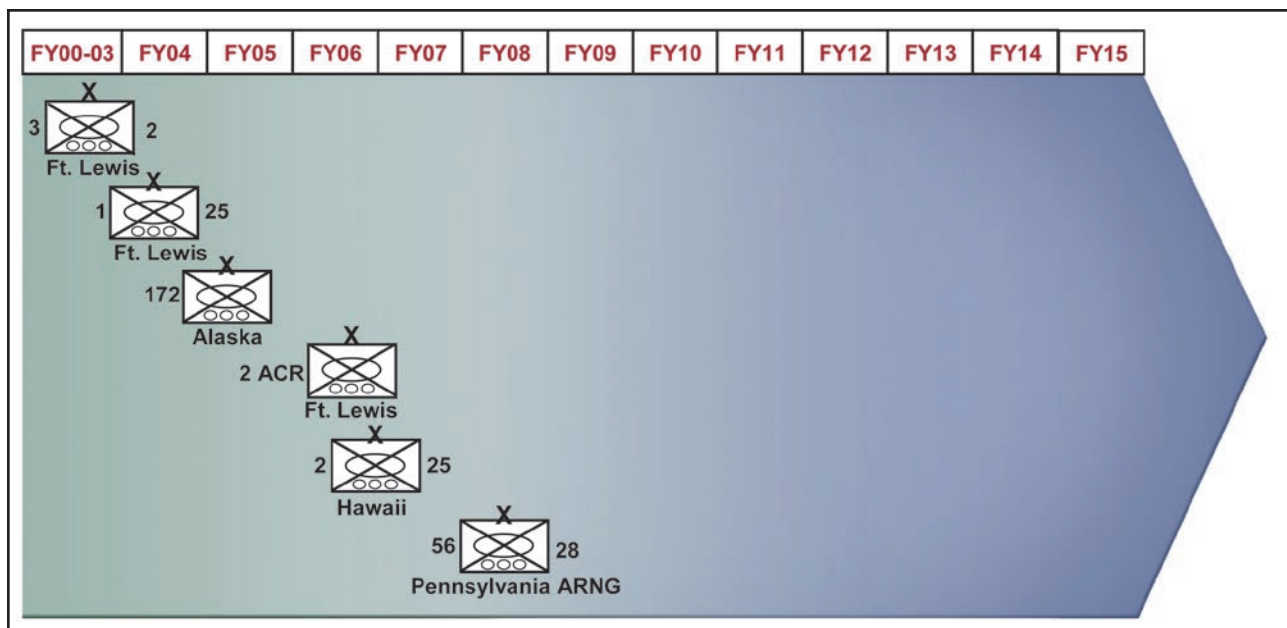


Figure D-6. SBCT Fielding Schedule

in Feb 04; these include the ICV, RV, CV, FSV, ESV, MEV and ATGM. The Army has fully funded, and the Secretary of Defense (SECDEF) has authorized, the procurement and fielding of six SBCTs to fulfill the defense strategy and national security requirements. This year, Congress added additional funds to support the building of a seventh SBCT. HQDA is currently working the plans for this new organization. Figure D-6 provides the current SBCT fielding schedule.

### **Lightweight 155 Howitzer (M777)**

**Description.** The Army has a requirement for an advanced, towed, lightweight 155 mm howitzer, with self-locating and aiming capability, that meets increased operational thresholds for mobility, survivability, deployability and sustainability. The M777 Lightweight 155 mm Howitzer is funded in the FY06-11 program plan as a weapon system that meets this requirement. A joint U.S. Marine Corps (USMC)/Army program, the M777 will provide accurate, reliable, responsive, on-demand, 24-hour, all-weather and all-terrain close support fires to maneuver forces.

**Program Status.** In Nov 02, the M777 entered LRIP for 94 USMC nondigitized howitzers to be delivered in FY04 and FY05. The FY06-11 program plan funds the procurement and fielding of the digitized, self-locating, self-aiming/-pointing upgrade of this system (M777E1) to selected Army units, beginning with the SBCTs in FY06-08. USMC howitzers will be retrofitted for the digitized upgrades once fielding to Army units begins. A multi-Service operational test and evaluation (OT&E) will be conducted during Oct 04, and a multi-year production decision is planned for 2QFY05.



## **Future Combat Systems (FCS)**

**Description.** The core of the Future Force's maneuver UA is the FCS, comprised of 18 manned and unmanned platforms centered around the Soldier and integrated by a secure battle command network. FCS will provide Soldiers with significantly enhanced situational awareness—enabling them to see first, understand first, act first and finish decisively. This allows the Joint Force to achieve overmatching combat power with the lethality, agility, sustainability and versatility necessary for full-spectrum military operations from small-scale contingencies to stability and support operations to major combat.

The FCS comprises a family of advanced, networked, air- and ground-based maneuver, maneuver support, and sustainment systems. FCS employs a revolutionary, integrated

architecture to help meet the commander's requirements. These networked capabilities include networked communications, networked operations, sensors, battle command systems, training platforms, and both manned and unmanned reconnaissance and surveillance capabilities. These capabilities will enable improved situational understanding and operations at a level of synchronization heretofore unachievable.

**Program Status.** The first major step for the FCS was achieved in May 03 with the successful approval of the Milestone B decision. This decision confirmed the feasibility of technology and initiated implementation of the original acquisition strategy to achieve an IOC in 2010 and a full operational capability (FOC) by 2012. In Jul 04, the FCS program was restructured to reduce program risk while simultaneously improving the Current

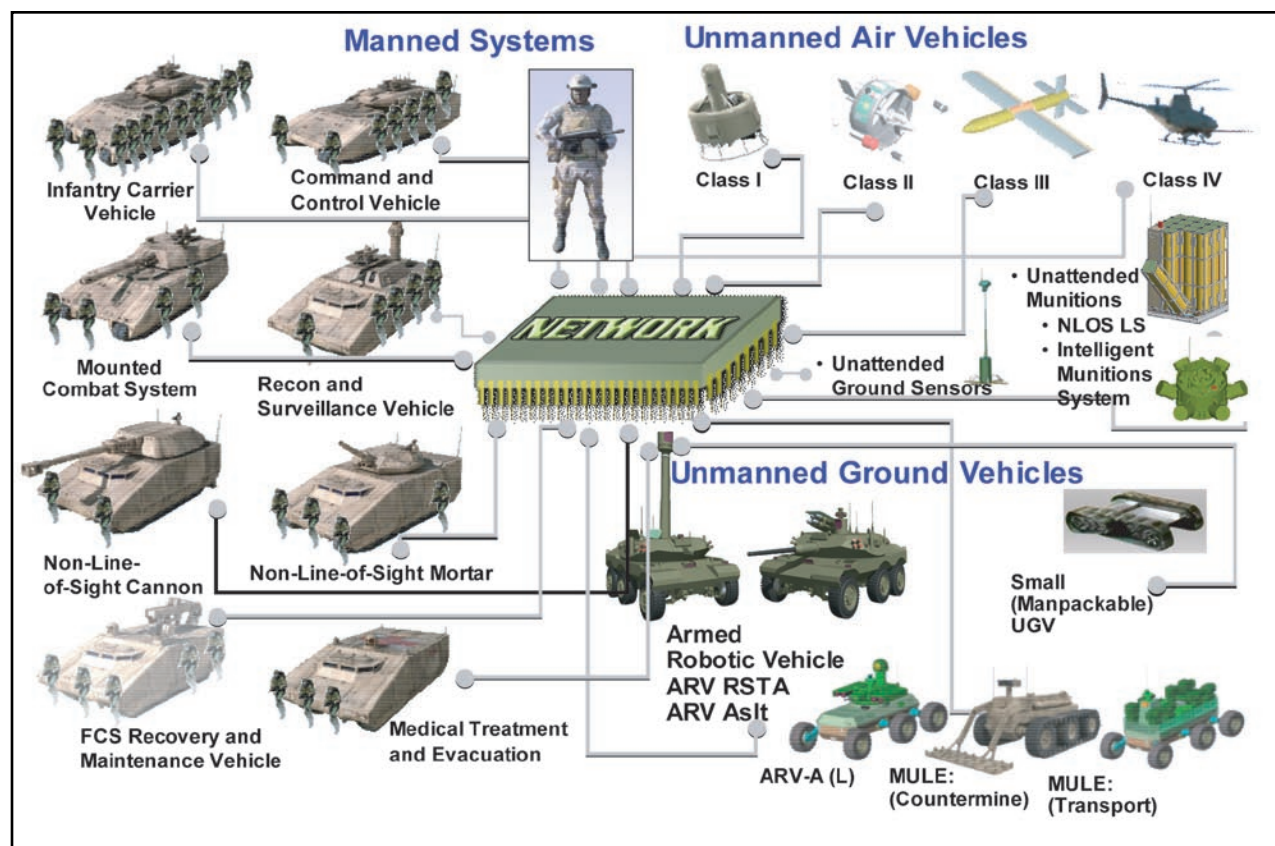


Figure D-7. Future Combat Systems

Force with the insertion of FCS technologies that will close Current Force capability gaps while maintaining the Army's focus on FCS UA development. This will result in an FCS-equipped UA (all 18 + 1 systems) IOC in 2014 and FOC in 2016. The acceleration of FCS technologies will be accomplished by a series of four "spirals" into modular BCTs (heavy, infantry and Stryker).

The first of four spirals will begin in FY08 with T&E by a single Current Force unit (evaluation BCT or E-BCT) that will serve as the consistent organization for the development and evaluation of FCS-related systems. Spiral 1 will start fielding to the Current Force in 2010. Subsequent spirals will be fielded initially to the E-BCT, then to select Current Force modular BCTs. The priority of the spiraling effort is initially to the network, unattended munitions and sensors, and unmanned systems. Elements of the network will be spiraled into each of the four spirals. Manned Ground Vehicle (MGV) development will be extended out to meet the 2014 IOC date for the first FCS-equipped UA. However, the Non-Line-of-Sight Cannon (NLOS-C) will lead MGV development and deliver preproduction NLOS-C systems in 2008 and begin fielding Block 0 common chassis of NLOS-C prototypes in 2010.

#### **Non-Line-of-Sight Cannon (NLOS-C)**

**Description.** The NLOS-C is currently embedded in the overall FCS program architecture. The NLOS-C will provide accurate, reliable, responsive, on-demand, 24-hour, all-weather and all-terrain close supporting fires as an integral part of the Future Force. It will utilize the Modular Artillery Charge System (MACS) and inductively set fuses, such as the M762/A1, M767/A1 and multiple option fuze, artillery (MOFA). As the primary fire support asset available to the UA commander, it will

provide sustained fires capability for both precision (Excalibur) and area fires (suppression) to forces in combat and are networked to joint fires. Its networked capability and high rate of fire enable it to provide rapid fires at extended ranges. System development will be integrated with the development of a suite of munitions and complementary ISR capabilities that locate, track, identify, engage and destroy all target types with effects scaled by the mission and target set.

**Program Status.** The Army, in partnership with the Defense Advanced Research Projects Agency (DARPA) has established an aggressive, collaborative demonstration program in support of the FCS initiative. This demonstration included both live-fire and mobility phases. An FCS program manager has been assigned to DARPA and the overall management authority for the FCS program resides with the Program Executive Officer (PEO) for Ground Combat Systems. NLOS-C transitions to SDD as a component of FCS.

#### **Non-Line-of-Sight Launcher System (NLOS-LS)**

**Description.** The NLOS-LS is currently part the overall FCS program architecture. The NLOS-LS is a networked system of missile launchers with an integrated command and control system that will provide precision and loitering attack munitions (PAM and LAM). It will provide accurate, reliable, responsive, on-demand, 24-hour, all-weather and all-terrain fires as an integral part of the Future Force. NLOS-LS will provide networked, extended-range targeting and precision attack of armored, lightly armored and other stationary and moving targets during day, night, obscured and adverse weather conditions. The system's primary purpose is to provide responsive precision attack of high-payoff targets (HPT) in support of the UA

in concert with other UA NLOS systems as well as other Army, JIM system capabilities. Future technology improvements will allow the system to provide a discriminating capability via automatic target recognition (ATR) and contribute to battle damage assessment (BDA). The system has flexibility to respond to all UA sensors, SOF, and other UE joint and multinational elements. The NLOS-LS will be a self-contained system with multifunctional munitions capability. The system will be capable of multimodal transport and be fired from the ground or from manned/unmanned tactical transport vehicles. NLOS-LS consists of the container launch unit (CLU) housing individual containerized munitions, PAM and LAM, and an onboard command and control capability. Operational requirements may necessitate the development of additional munitions variants such as thermobaric and nonlethal applications. Variants will be the smallest number that satisfies all requirements. The system has an external mission planning software application designed to operate on the future battle command system for planning and execution of multiple and simultaneous missions, including engagement with different munitions.

**Program Status.** The Army, in partnership with the DARPA, is involved in an aggressive, collaborative demonstration program in support of the NLOS-LS initiative that transitioned to an Army SDD effort in FY04. An NLOS-LS Task Force was formed under PEO Tactical Missiles to facilitate the transition and coordinate actions to ensure initiation of NLOS-LS Block I SDD.

### **High Mobility Artillery Rocket System (HIMARS)**

**Description.** HIMARS provides Current and Future Forces with continuous, all-weather, precision, medium- to long-range rocket and



missile fires to a depth of 300 km. Mounted on an FMTV chassis, HIMARS is C-130 transportable, combat loaded, and provides full Multiple Launch Rocket System (MLRS) family of munitions (including GMLRS and ATACMS) capability, yet requires 70 percent fewer airlift resources to transport than the current M270 MLRS launchers. HIMARS Advanced Concept Technology Demonstration (ACTD) prototype launchers were successfully employed in OIF, providing precision fires in support of USSOCOM and Army operations.

**Program Status.** HIMARS is in LRIP with FUE programmed for 2QFY05 to the XVIII Airborne Corps.

### **Discussion of Key Ground Force Munitions Programs**

#### **Army Tactical Missile System (ATACMS) Family of Munitions**

**Description.** The ATACMS family of munitions (FOM) provides the joint force commander with a surface-to-surface, all-weather, responsive, deep-strike weapons capability for the attack of area and point targets from ranges of 25-300 km. ATACMS has been produced since 1990 in a logical series of improvements to range, accuracy and lethality. ATACMS Block I proved its effectiveness

during Operation Desert Storm. A significant number of Blocks I, IA and Quick Reaction (QR) Unitary were successfully employed in OIF in support of USAF, USMC, USSOCOM and Army operations. The entire ATACMS FOM is launched from improved MLRS M270A1 and HIMARS rocket and missile launchers.

**Program Status.** The FY06-11 program funds procurement of ATACMS Unitary missiles and initiates a Service Life Extension Program (SLEP) for Block I and IA missiles that are approaching the end of their shelf life. An



ATACMS Penetrator (ATACMS-P) variant is being developed and demonstrated as part of a cooperative Army/Navy ACTD that will be completed in FY05 with three test firings and delivery of six residual missiles to

United States Forces, Korea (USFK). There is no follow-on program for ATACMS-P.

### **Chemical Energy Missiles—Javelin and TOW 2B**

**Description.** The Javelin missile provides dismounted infantry with a medium-range, man-portable, shoulder-launched, fire-and-forget, anti-armor weapon system that provides a highly formidable capability able to defeat all known armor threats for the dismounted close fight. As a fire-and-forget missile with top and direct attack modes and 2.5 times the range, Javelin is a leap-ahead improvement over the Dragon system. Moreover, the Javelin's command launch unit incorporates an integrated day/night sight and greatly improves battlefield surveillance and survivability. Javelin has fire-and-forget

technology that allows the gunner to lock on to the target, fire the missile, and immediately take cover. Other features include a tandem warhead, an imaging IR seeker and a soft launch that allows the missile to be fired from enclosures. In addition to its high lethality, Javelin is ideally suited to rapid deployment due to its size, its high reliability, and its very small logistics tail. The Javelin has won high praise from commanders engaged in combat operations during OEF and OIF. For example, during the Apr 03 battle of Debecka Pass in northern Iraq, the Javelin missile played a decisive role in enabling an SF unit to destroy an attacking armor formation. Lessons learned from these operations are shaping the Javelin P3I program.

**Program Status.** Javelin FUE was Jun 96 with FRP beginning in May 97 and scheduled to continue through FY09. Javelin is currently being fielded to infantry, armor scouts, and combat engineer units. The Block I program includes improvements in the command launch unit for better target detection, recognition and identification, and extended surveillance time; the missile includes improved performance at maximum range, reduced flight time, reduced acquisition time and Counteractive Protective System interface. The Javelin weapon system is part of the FCS, dismounted with the ICV and integrated with the Armored Robotic Vehicle-Assault Light (ARV-A (L)) multifunctional utility/logistics and equipment (MULE), and provides risk mitigation paths for the ARV-A (6-ton vehicle). The Feb 04 joint requirements validation of the Stryker ORD included a revision to in-



tegrate the Javelin into the Stryker Remote Weapons Station (RWS) on the ICV variant of the Stryker vehicles.

**Description.** The TOW weapon system is a crew-portable, vehicle-mounted, heavy anti-armor weapon system designed to defeat armored vehicles and other targets such as field fortifications. The TOW weapon system provides the heavy anti-armor/assault capability for the Army's infantry forces (airborne, air assault, light, SBCT and Bradley-equipped mechanized) and the USMC forces with the TOW-equipped HMMWV, LAV and Cobra helicopters. The TOW family of missiles provides a man-in-the-loop, precision-point targeting capability, which serves to minimize collateral damage—a preeminent consideration in current and emerging operating environments. During OIF, the TOW missile fired from the Improved Target Acquisition System (with second generation FLIR), won accolades from the 101st Airborne Division (air assault) for the decisive role these systems played in enabling the division to employ precision fires to destroy enemy forces while also avoiding collateral damage. The modernized TOW 2B (Aero) missile provides even greater range and countermeasure defeat to TOW-equipped units and will mitigate TOW inventory risk. The TOW Bunker Buster missile (TOW BB) was fielded to the first SBCT in Nov 03 as an in-lieu-of mitigation item for the Stryker ATGM until the Stryker MGS is fielded.

**Program Status.** Procurement was 2,861 TOW 2B missiles from the projected requirement of 12,332 missiles funded in the FY06-11 program plan. The Army plans additional procurements in the FY06-11 program plan to maintain a minimum production line sustainment rate.

### **Guided MLRS (GMLRS) Rocket**

**Description.** The MLRS M26 basic rocket is nearing the end of its shelf life and is now out-ranged by many enemy artillery and rocket systems. Guided MLRS is a major upgrade to the M26 series rocket that integrates a guidance and control (C&C) package and a new rocket motor to achieve greater range and precision accuracy. Launched from an M270A1 MLRS tracked or HIMARS wheeled launcher, GMLRS rockets are precision-guided munitions (GPS-aided Inertial Measurement Unit (IMU)) that enable a force to engage and destroy targets at ranges in excess of 60 km, with precision, and with fewer rockets, reducing the logistical resupply burden associated with unguided area munitions.



The Dual Purpose Improved Conventional Munition (DPICM) version of the GMLRS contains 404 submunitions (M77 grenades) to attack area targets. Fuze improvements, combined with the improved accuracy will also greatly reduce the hazard to operational maneuver and collateral damage from unexploded ordnance. A self-destruct fuze for the DPICM grenades is also being developed with European partners and will be incorporated into production. The GMLRS Unitary rocket variant will replace the DPICM submunitions payload with a unitary warhead that will have a multimode (point detonating, delay and proximity) fuze capability.

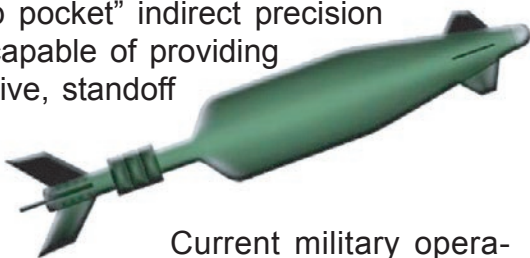
Typical threats to be engaged include self-propelled and towed artillery; multiple rocket launchers; forward-positioned, surface-to-

surface missiles or enemy air defense; a wide variety of active and passive, soft or lightly armored vehicles; and area or point targets with no collateral damage constraints. The GMLRS Unitary rocket will provide the ability to attack critical area and point targets in restricted terrain (under foliage, urban environments, and heavy snow) that may require reduced collateral damage effects.

**Program Status.** GMLRS DPICM development was an international program with the United Kingdom, Germany, France and Italy. GMLRS DPICM began LRIP in FY03 and will achieve IOC in 3QFY05. GMLRS Unitary is currently a U.S.-only effort in SDD. The GMLRS Unitary rocket development has been accelerated and will be developed and fielded using an evolutionary acquisition strategy and spiral development process to field a capability no later than the end of FY06. The evolutionary strategy approach will deliver a capability to the Soldier in increments, recognizing, up front, the need for or opportunity to integrate technologies that support future capability improvements.

### **120 mm XM395 Precision Guided Mortar Munition (PGMM)**

**Description.** PGMM is a 120 mm laser-guided precision mortar munition, designed to defeat high-payoff targets with low collateral damage. It is the maneuver task force commander's "hip pocket" indirect precision effect, capable of providing responsive, standoff defeat of high-value targets.



Current military operations have underscored the immediate and significant need for an organic, responsive, indirect-fire, extended-range, precision-strike munition that has significant capability against

a variety of protected targets. Targets are threat infantry protected by field fortifications, masonry walls, or lightly armored vehicles. 120 mm mortars are key organic lethality platforms for the Current and Future Forces. PGMM is the key lethality system for the close fight.

**Program Status.** PGMM transitioned into the SDD phase in 1QFY04 with production scheduled to begin in FY08 and fielding in FY10.

### **Excalibur**

**Description.** Excalibur is a cannon-delivered, precision-guided, extended-range family of 155 mm artillery projectiles that self-guide to a programmed aim point using GPS. Excalibur will deliver 10-meter circular error probable accuracy from minimum (8 km) to maximum (35-40 km) range in all weather conditions. Anti-jam technology and an inertial navigation system are used to provide precision-strike capability in a GPS-jamming environment. Target and fuze data are programmed into the projectile via an inductive projectile programmer Enhanced Portable Inductive Artillery Fuze Setter (EPIAFS). Excalibur uses an optimized (near-vertical) terminal trajectory to engage targets in urban and complex terrain with minimal collateral damage. Excalibur will overcome the limitations of current area engagement munitions with precision, increased range, lethality and minimal collateral damage.

**Program Status.** Excalibur is in SDD and is a cooperative international development program with Sweden. The first spiral of Increment I will provide an initial capability to the JLW 155 Howitzers (M777E1) for the Stryker brigades in FY06. The second spiral of Increment I will provide an IOC to the M777E1 and NLOS-C in FY08. Future unitary variant

spirals will reduce costs, refresh technology and enhance performance capabilities to reflect evolving requirements.

### **Course Correcting Fuze (CCF)**

**Description.** CCF and the Navy's Guidance Integrated Fuzing (GIF) program represent a cooperative effort to demonstrate, further develop and produce a fuze that will enhance the accuracy and effectiveness of DOD's conventional artillery munitions stockpiles. GIF/CCF will use GPS guidance and small canards to apply minor corrects to the ballistic trajectory of conventional artillery projectiles. The round will follow a normal ballistic trajectory, and the fuze will apply in-flight corrections to deliver the round to the target with much greater accuracy than current rounds. The program's intent is to deliver increased accuracy at a low cost. It will represent the middle of the spectrum of capabilities available for the commander, providing significantly increased accuracy over current artillery rounds, but not the degree of accuracy provided by precision munitions such as Excalibur.

**Program Status.** CCF RDTE begins in PB06 and the first delivery of CCF fuzes is expected in FY09-10.

### **Mid-Range Munition (MRM)**

**Description.** MRM is an autonomous and laser-guided smart munition fired from an FCS Mounted Combat System Increment I vehicle. This munition extends the maneuver commander's battlespace BLOS to more than 12 km. MRM exploits the ability of the FCS-equipped UA to identify targets at greatly extended ranges, as well as pass digitized targeting information, in real time, to the maneuver commander or shooter. It also exploits autonomous and smart munitions technologies to provide a munition capable of

being fired from a platform at extended range BLOS targets. There are currently two MRM round concepts being pursued, MRM-KE and MRM-CE.

MRM-KE is an advanced guided, boosted, kinetic energy (KE) anti-armor smart munition capable of defeating current and advanced armored threat vehicles from close in to extended BLOS ranges. It utilizes a kinetic energy rod and rocket motor technology to thrust the round towards the target at a very high speed for defeat. An MMW autonomous seeker or SAL, along with radial maneuver thrusters, is used to acquire and guide the round towards the target with high accuracy. The projectile uses fins to aerodynamically induce spin and accelerometers to provide body motion data to ensure proper dynamics for seeker search area processing.

MRM-CE is an advanced, guided, chemical energy (CE) anti-armor smart munition capable of defeating current and advanced armored threat vehicles from fairly close in to extended BLOS ranges. It utilizes a dual tandem, chemical energy, shaped-charge warhead at relatively slow round impact speeds for target defeat. A dual-mode MMW, imaging infrared (IIR) autonomous seeker or SAL is used to acquire and guide towards the target with high accuracy. The sensors are mounted on a unique ball-joint gimbal to accomplish sensor imaging and large sensor search areas for target acquisition. The projectile uses canards and fins to stabilize the round and IMU technology to allow it to glide accurately towards the target during seeker search and terminal impact.

**Program Status.** The MRM program completed an ATD phase in Dec 03. A Milestone B decision was made in 4QFY04. The SDD phase will start FY05 with a Milestone C decision scheduled for FY09 and FRP in FY10.

## Force Application Capabilities Summary

Stryker, FCS, HIMARS and the other materiel programs described in this appendix readily demonstrate the Army's modernization efforts to develop network-centric forces enabled by superior situational understanding and decision-making speed, capable of dominant maneuver and precision engagement (force application) as part of the joint team.

As the Army transforms to a Future Force design and capability, it will explore new and promising technologies that will provide enhanced force application capabilities. Inherent in this design is the requirement for all means of precision engagement to operate within a joint and combined system of systems and to be strategically responsive so that it remains an effective partner in the joint fight. This means that the Army must maximize commonality of organizations and equipment as well as fully leverage information technologies. Army transformation will meet these key requirements.

## Appendix 2: Protection

Protection is the sum of all actions taken to prevent an adversary's effect on the Joint Force and the population that the Joint Force protects. These actions include protection of personnel, infrastructure and critical computer networks. Because WMDs pose a unique and catastrophic threat to personnel and infrastructure, special measures must be taken to deter and mitigate the effectiveness of an adversary's use of WMD. These measures include WMD counterproliferation, nonproliferation before an attack, active defense measures during an attack, and our ability to conduct effective consequence management following an attack using WMD.

Protection is accomplished through the planned and integrated application of several security-related and supporting operations and programs including law enforcement, physical security, protective services operations, critical infrastructure protection, information operations, crisis response, consequence management, intelligence and counterintelligence, intelligence fusion, counterterrorism and antiterrorism, and through air and missile defense (AMD) and chemical, biological, radiological, nuclear and high-yield explosive (CBRNE) defense measures.

The Army provides full-dimensional protection against enemy effects at the strategic, operational and tactical levels to the homeland, our allies and coalition partners, and the Joint Force. The protection of national or host nation assets and national centers of gravity is vital to the strategic level of operations from which national or combat power is generated.

The Army's priority of efforts in force protection remain focused on supporting operational forces and equipment deployed and in-transit; capitalizing on threat reporting and coordination with international/national intelligence and law enforcement agencies; enhancing detection and deterrence capabilities for CBRNE threats; institutionalizing installation access control for personnel and vehicles; improving policy and doctrine; strengthening training and exercises; and expanding force protection assessments.

The Army continues to ensure all mission essential systems are hardened to survive NBC effects, function in NBC environments, and are decontaminable. This will ensure that Current and Future Forces are prepared to operate in NBC environments.

Physical security programs continue to focus on ensuring the adequacy of policy and programs, physical security technology initiatives, access control, and civilian police and guard initiatives necessary to ensure the security of individuals and property in support of worldwide Army operations. The Army is continuing to assess its critical infrastructure to ensure adequate protection against potential threat actions.

This appendix provides a brief discussion of Army protection capabilities, specifically, Army AMD and CBRNE defense capabilities and key materiel programs associated with these capabilities. The importance of space-based capabilities and their role in force protection is also described.

### **Air and Missile Defense Capabilities**

In the midst of AMD transformation efforts, AMD forces remain deployed worldwide in support of current U.S. efforts in the global war on terrorism and homeland defense. Patriot units are positioned in South Korea as a deterrence measure and sign of continuing U.S. commitment to that nation. Air and missile defense battalions are supporting operations in OIF. In addition, Air Defense and Airspace Management (ADAM) Cells are deployed with their parent SBCTs, with additional ADAM Cells slated to deploy in support of OIF 3. AMD units also contribute to the defense of the National Capitol Region. AMD weapon systems and integration platforms are viable enablers to the President and SECDEF's joint command and control network, which is crucial to homeland defense operations.

The U.S. AMD transformation plan is fully aligned with ongoing and future DOD, Army and joint transformation policy guidelines. AMD forces are designed to meet the challenges of the future operational environment,

the area-denial/anti-access strategies adversaries will employ, and the asymmetrical aerial capabilities they will use against joint and coalition forces. AMD forces are postured to fight as part of the joint team at strategic, operational, and tactical levels and possess the required capabilities to successfully execute all assigned warfighting missions. AMD's transformation fully supports Army modular force conversion in that it provides the combatant commander with scalable, modular and tailorable force packages that possess a joint and expeditionary mindset. This is accomplished via the joint AMD system-of-systems approach that will also contribute to the attainment of Defense Transformation Planning Guidance (TPG) operational goals. AMD transformation is consistent with and draws from Joint Operating Concepts, Joint Functional Concepts, and Joint Integrating Concepts.

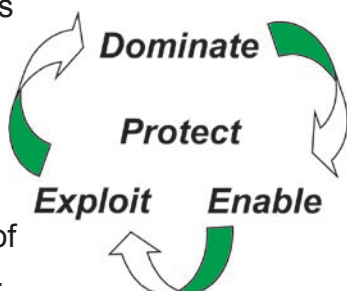
All of these factors combine to ensure that AMD transformation efforts in the DOTMLPF domains result in a strategically integrated, responsive, deployable, agile, versatile, lethal, survivable and sustainable force that is a critical enabler to the Future Force and an indispensable asset to the Joint Operating Concepts. En route to the desired end state, Army AMD will pull as many capabilities forward from the future as technology and resources will allow, enhancing the warfighting capabilities of the Current Force.

### **Role in the Army**

The AMD mission states that AMD forces—fighting interdependently with other elements of the JIM team at strategic, operational and tactical levels—will provide AMD and contribute to situational awareness/understanding, airspace management, and operational force protection to deter or defeat enemy aerial threats, protect the force and high-value as-

sets, enable freedom to operate, and contribute to victory.

To accomplish this mission, transformed AMD forces must be able to dominate, enable, control and exploit the third dimension of the area of responsibility (AOR).



**Dominate.** Army AMD will help dominate the third dimension, interdependently with JIM forces, at strategic, operational and tactical levels, through joint attack operations; joint, layered active defense operations; joint passive defense measures; and integrated battle command. Modular, scalable, multifunctional Army AMD formations will be employed when and where required to deter and dissuade adversaries from using air and missile threats. Army AMD will help integrate and execute JIM offensive and defensive operations to deny enemy launch points and kill enemy air and missile threats on the ground before they can be launched. Mission-tailored AMD will also destroy enemy aerial RSTA beyond standoff, contributing to friendly force ability to see first by forcing the enemy to see last (or not at all). Army AMD will proactively kill in the air during midcourse and terminal phases of flight, at sufficiently long ranges to preclude warheads or target debris from harming friendly forces or assets.

**Enable.** Army AMD will help enable the third dimension and contribute to information superiority by integrating its sensor and battle command elements into the joint distributed network and providing continuous surveillance information that will support the Single Integrated Air Picture (SIAP) portion of a three-dimensional COP. These AMD sensors and battle command elements will provide

joint third-dimension situational awareness and understanding; provide Army linkage to the joint identification/engagement authorities; facilitate planning, coordination and synchronization of airspace activities and linkage to the Joint Airspace Control Authority (ACA); help enable trajectory clearance for ground-to-ground, ground-to-air and air-to-ground fires; and protect friendly aerial objects.

**Control.** Control is exercising, regulating, and governing the Army use of airspace in close coordination with the joint airspace control authority. Control assures discrimination of all airspace objects, virtually eliminating the risk of fratricide; enhances force protection for air and ground forces; and increases the overall effectiveness of the force.

**Exploit.** By dominating and enabling in the airspace, joint and coalition forces can better exploit it for their exclusive operational benefit. AMD and joint forces will exploit the third dimension by using it to conduct inter- and intra-theater operational maneuver from strategic distances and to sustain noncontiguous forces via air. Modular, multifunctional AMD task forces will be deployable on C-130/Future Force airlift and will help enable the force to project and sustain in an anti-access environment by protecting critical bases of operation and protecting joint vertical entry forces. Army AMD ground and elevated sensors will provide extended range surveillance of aerial and ground targets that can be exploited to support offensive and defensive NLOS engagements. Army AMD elevated sensors will be multifunctional platforms providing long-endurance communications relays to distribute actionable information to enable commanders to effectively integrate, coordinate and synchronize warfighting operations with dispersed forces on the nonlinear battlefield. Army AMD and joint forces will leverage space and aerial ISR capabilities to support

joint attack operations and provide early warning of air and missile attack to at-risk forces and civilian populations.

## **System of Systems (SoS)**

Integrated AMD capabilities are crucial elements supporting our National Security Strategy. Capability integration will reflect an understanding that solutions or systems operating in each of the domains have strengths and weaknesses. The joint force commander will arrange and employ capabilities in mutually beneficial ways to capitalize on strengths and offset weaknesses.

Global considerations will influence operational focus against threats that can rapidly deliver WMD against the homeland and outside the AOR. This will require offensive/defensive capability integration and operations within and among Joint Force commands. Active AMD will provide a layered defense with multiple engagement opportunities against threats.

The regional fight may be constrained by limited assets due to strategic imperatives, short warning times for deployment, limited lift, and immature AORs. The Joint Force will mitigate these challenges through offensive/defensive JIM integration through AMD integration platforms.

Joint, integrated AMD is a critical warfighting requirement that protects our homeland, deployed forces, friends and allies. This capability is achieved through an effective SoS application and synergy consisting of sensors, shooters, and battle management command, control, communication, computers and intelligence (BMC4I). The Army AMD SoS is designed to offset the problems related to Service-specific or stovepiped systems—limited interoperability or joint functionality, limited capability to maximize engagements out to

kinematic ranges, lack of a fused air picture, no persistent wide-area detection capability and limited engagement battlespace—due to the range and terrain limitations of single systems.

The Army AMD SoS program is synchronized with other Services and in many aspects is leading the way to develop a Joint Force AMD SoS to counter ballistic missiles, CMs, unmanned aerial vehicles, tactical air-to-surface missiles, rockets, artillery and mortars, and rotary/fixed-wing aircraft threats. To better maximize the SoS approach, Army AMD is changing the way it organizes and fights with the development of composite AMD units that are modular and multifunctional. The benefits of this dual transformation are significant: offsets the limitations of a single system, significantly increases the effectiveness of the area air defense commander's defense design, enhances modular or task force operations, reduces the limitations created by autonomous operations, reduces fratricide and increases the engagement battlespace against all AMD threats.

## **AMD Organizational Transformation**

The first phase of the organizational transformation effort is based on expanding joint and Army future concepts; Future Force attributes and characteristics; changes in technology; AMD lessons learned from OIF and other operations, wargames, and experiments; and current joint and Army AMD capability gaps analyses.

AMD organizations will be structured to meet National Military Strategy (NMS) needs and support future joint and Army formations in garrison and war. The AMD organizational vision is fully embedded with the modular Army Future Force vision. All forces are considered “pooled” and available to support any future

JIM headquarters with mission-tailored packages. Army AMD transformation will optimize the synergy between the AC and RC forces in order to meet the requirements inherent in homeland security, strategic deterrence, stability operations, and major combat operations Joint Operating Concepts.

Unit transformation begins with the battalions but stretches across all AMD echelons. Composite AMD units (combat formations that possess the full spectrum of AMD combat potential) will be created. Initially consisting of Patriot and Avenger batteries, they will evolve into a Surface-Launched Advanced and Medium Range Air-to-Air Missile (SLAMRAAM) and Medium Extended Air Defense System (MEADS) combination. AMD batteries or battery teams will be the primary battle elements to achieve effects on the battlefield at maneuver UA, UEx and strategic levels. They can rapidly deploy, achieve one or more required lethal effects without augmentation, and sustain unit operations. They can fight independently but generally will serve as subordinate multifunctional AMD task force elements. All AMD combat units will be pooled at the UEy level under AMD brigades for rapid integration into UEy or UEx formations, in support of BCTs, as the operational/threat environment requires.

The AAMDC is the senior Army AMD battle command headquarters at the UEy level and commands AMD forces (brigades) assigned to operate at that level. It has, in concert with the Joint Force's Area Air Defense Commander, overall mission responsibility for the planning, integration and execution of Army air and missile defense operations. AAMDCs are regionally focused headquarters. The two AC AAMDCs conduct frequent, short-notice deployments in support of USPACOM and USCENTCOM. The RC AAMDC is focused

on the defense of the CONUS and the other geographic combatant commanders' AORs. The Terminal High Altitude Area Defense (THAAD) and Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) systems, along with their supporting command and maintenance units, are envisioned to be assigned to regionally focused AMD brigades.

Army AMD transformation is aligned with the Defense Strategy, recommendations from the *2001 Quadrennial Defense Report* and supports attainment of DOD's critical operational goals, the *Army Transformation Roadmap*, *Joint Vision 2020*, *JTAMD 2010 Operational Concept* and the Protection Joint Functional Concept. Army AMD transformation supports joint interdependence by reducing focus on areas well covered by the Joint Force (such as defeating the fixed-wing threat) and by providing the Joint Force its only current capability against short-range ballistic missiles and the first integrated capability against advanced CMs. Over 85 percent of Army AMD's investment strategy is dedicated toward filling critical Joint Force capability gaps.

The critical components of the capabilities essential to the Joint Force include the Combined Aggregate Program (PAC-3/MEADS), THAAD, JLENS, SLAMRAAM and Integrated Fire Control (IFC).

As a result of changes in the future operational environment, our Army is pursuing the most comprehensive force transformation in the past century as part of the joint effort to transform America's military to protect our national security interests. Army AMD continues to be an essential element of Joint Force operations and provides the right capabilities for joint and Army Future Force success.

## Discussion of Key AMD Materiel Programs

Army modernization for AMD provides key components and capabilities of the joint AMD SoS.

**Shooters.** Aerial threats have diverse profiles and target characteristics that impact active defense weapon systems design and development. Army modernization is on schedule to provide systems capable of defeating a wide range of the aerial threats from advanced CMs up through tactical ballistic missiles. Joint interdependence—Patriot and THAAD provide the only capability against tactical ballistic missiles (TBMs). Additionally, Army AMD will provide the first integrated advanced CM capability with the development of SLAMRAAM.

### **PAC-3/MEADS Combined Aggregate Program (CAP)**



**Description.** With the approval of the Defense Acquisition Executive (DAE), the Army has combined the management, development and fielding of the Patriot and MEADS programs. The PAC-3/MEADS CAP is based on the concept that the MEADS objective capability will be achieved through an evolutionary approach by incrementally inserting MEADS major end items (MEIs) into the current Patriot system, thereby providing increased capability to the field in a timelier manner. This approach allows for earlier modernization and fielding of enhanced capabilities to the

currently fielded Patriot forces in conjunction with recapitalization efforts. Also, the evolutionary development and fielding of MEADS provides linkage to the Army's fully networked battle command capabilities bridge from the Current to Future Force, enables interdependent network-centric warfare, facilitates FCS interoperability, and fully supports the Joint Operating Concepts. Finally, the CAP ensures that required AMD capabilities are fielded to achieve the protection joint functional concept construct: detect, assess, warn, defend and recover.

Within the Current Force, Patriot is a corps/theater AMD system that can simultaneously engage and destroy multiple air and missile threats at varying ranges and altitudes. It is the world's only battle-proven theater AMD system and will be a key AMD element for the next 20 years. The Patriot system will provide the foundation for Army AMD transformational efforts, and will be the core of initial AMD composite units, comprised of Patriot and Avenger batteries. In the future, as MEADS MEIs are incrementally fielded to Patriot units, these composite AMD units will consist of MEADS and SLAMRAAM batteries. This construct will provide combatant commanders with modular, scalable, mission-tailored capabilities to dominate, enable and exploit the third-dimension battlespace and contribute to operational force protection in support of UA, UE, and joint force commanders in the future operational environment.

Currently, only eight of 10 AC Patriot battalions are funded for upgrades to PAC-3, allowing for a mixed force of battalions with significantly different capabilities. PAC-3 provides a remote-launch capability, which significantly extends the defended area; increases range, altitude, and firepower with new hit-to-kill missile and ground support equipment; and engages multiple TBMs,

Major End Items	Objective Quantity	LRIP Quantity	Initial Production
BMC4I TOC	180	8	FY08
Launcher	310	12	FY10
Reloader	153	6	FY10
MSE	1,528	148	FY10
Surveillance Radar	87	17	FY13
Fire Control Radar	156	28	FY13

air-breathing threats (ABT) and CM threats. Patriot recapitalization is ongoing to improve the operational capability by bringing existing Patriot assets to a “like-new” (zero-miles/-hours) state, thereby achieving OSD’s Setting the Force objectives and enabling the Army to meet future combatant commander requirements. PAC-3 system upgrades are planned to counter evolving threats, improve joint interoperability, and increase surveillance and detection capabilities required as part of evolutionary development. Further, to support current operations, congressional committees have resourced nine capability upgrades that will be fielded to Patriot units in FY05-07 to correct deficiencies identified in OIF lessons learned. These Patriot OIF fixes include upgrades in air-to-ground communications, software improvements in training scenarios to address spurious tracks and track correlation, software upgrades that improve classification, identification, friend or foe (IFF) enhancements, Link-16 joint range extension, embedded data recorder replacement, radar shroud monitor, battery command post (BCP) acceleration, and upgrades to AMD training centers.

MEADS will provide joint and coalition forces critical asset and defended area protection against multiple and simultaneous attacks by TBMs, CMs and other ABTs. MEADS will have a netted and distributed architecture with modular components to increase survivability and flexibility of employment in a

number of operational configurations. The objective MEADS battery will be scalable and tailorable to operational requirements. It will consist of a BMC4I tactical operations center (TOC) that is capable of integrating into Army and joint SoS BMC4I architectures, enabling distributed system operations and BLOS engagements, for maximum protection of supported forces by engaging at longer ranges; a lightweight launcher capable of transporting and launching up to eight missiles; a reloader; the PAC-3 missile; an ultra-high frequency (UHF) surveillance radar (SR) that provides 360-degree coverage and near-range to long-range detection of low-radar, cross-section targets; and two X-band Multifunction Fire Control Radars (MFCR) that provide 360-degree coverage and are designed for high-precision handover to the in-flight missile, discrimination capabilities, and short-range target detection and horizon search.

In addition, MEADS will provide significant improvements in strategic deployability, transportability, mobility and maneuverability. Its substantially reduced lift requirements enable MEADS to be deployed rapidly with essential combat loads via inter-/intra-theater land, sea and airlift anywhere in the world. MEADS will provide combatant commanders with an AMD system that is fully transportable by C-130 aircraft, thus increasing strategic and tactical mobility. Further, its decreased size and weight and ability to conduct rapid march order and system emplacement will enhance

maneuverability, thereby providing better AMD protection to maneuvering forces.

While the PAC-3 missile is the baseline missile for MEADS, the Missile Segment Enhancement (MSE) missile is being developed to meet U.S. operational requirements. MSE will provide a more agile and lethal interceptor that increases the engagement envelope while enhancing insensitive munitions compliance. MSE will significantly contribute to increasing MEADS capability to “defend” as part of the Protection Joint Functional Concept construct.

The CAP increments will improve the current Patriot capability to protect forces during the transformation to MEADS. MEADS MEIs will be developed and fielded in three acquisition increments that comply with and are in support of Air Space and Missile Defense (ASMD) and joint SoS capabilities:

**CAP Acquisition Increment 1 (FY09).** The Increment 1 architecture integrates the initial MEADS BMC4I capability into the Patriot force. The BMC4I TOC will be C-130 deployable and will provide for an initial common BMC4I for both the PAC-3/MEADS CAP and the SLAMRAAM, which enables BLOS engagements with SLAMRAAM using JLENS or Patriot fire control data.

**CAP Acquisition Increment 2 (FY11).** The Increment 2 architecture includes the MSE missile in a single-canister configuration, the MEADS near-vertical launcher with reloader, and an associated BMC4I software update to support fire control of the new missile. All three of these components, when integrated into the SoS architecture with JLENS (elevated sensor), will significantly increase the defended area by enabling engage-on-remote (EOR) capability against incoming threats. EOR capability will enable units to take ad-

vantage of the significant improvements of the MSE missile, providing increased protection to tactical formations and defended assets.

**CAP Acquisition Increment 3 (FY15).** The Increment 3 architecture will begin integrating the objective MEADS configuration. An updated BMC4I will include a communications backbone and software functionality to enable rapid transition of elements within the architecture to support tactical mobility requirements. Also, Increment 3 integrates the new SR and two MFCRs into the fire unit/battery. The associated surveillance, fire control, classification discrimination and identification (CDI) and battle management functionality will offset current operational shortfalls/capability gaps in the areas of sectored systems, stressing threats, strategic and tactical mobility and combat identification (CID). Enhancements in CID will significantly contribute to fratricide prevention by incorporating the capability to noncooperatively classify targets by type and specific platform, thereby contributing to the identification of unknown targets that may have nonfunctional IFF transponders.

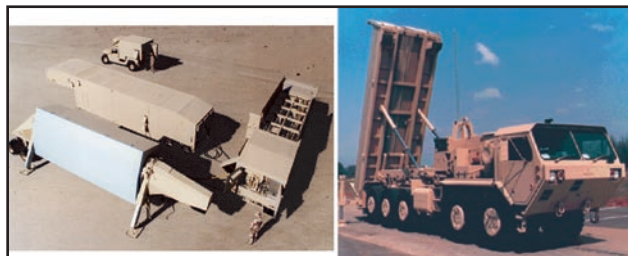
**Program Status.** The Army’s plan for the combined management, development and fielding of the Patriot and MEADS programs was approved by the DAE at the Defense Acquisition Board (DAB) on 07 Apr 03. On 01 Jul 04, the DAB approved Milestone B for all three CAP increments, with a FUE date in 2015 (battery-level). The Milestone B decision approved the program’s entry into SDD and the following LRIP quantities.

### **Terminal High Altitude Area Defense (THAAD)**

**Description.** THAAD is a ground-based missile defense system being developed to protect forward-deployed military forces, population centers and civilian assets from

short- and medium-range ballistic missiles. As an element of the Missile Defense Agency's (MDA) terminal defense segment, THAAD will provide the opportunity to engage ballistic missiles—outside or inside the earth's atmosphere—that were not destroyed earlier in the boost phase or midcourse phases of flight by other Ballistic Missile Defense System (BMDS) elements, such as Aegis.

A THAAD unit consists of a command and control/battle management component, truck-mounted launchers, interceptors, an X-band radar and ground support equipment. The THAAD interceptor is comprised of a single-stage booster and a kinetic kill vehicle, which destroys enemy warheads through hit-to-kill collisions. The THAAD radar is a solid-state, phased-array, X-band radar that performs search, track, discrimination and other fire control functions. The THAAD radar also sends updated target information to the kill vehicle while in flight.



**Program Status.** MDA is developing THAAD in incremental, capabilities-based blocks. Flight tests scheduled to begin in FY05 are part of an extensive T&E program that will demonstrate the capability of the ongoing research and development activities. The THAAD acquisition strategy will rely on test program results to gain knowledge and will use that knowledge to make future acquisition and Army transition decisions. The first THAAD fire unit will be fielded in FY09. THAAD will have an emergency activation surveillance capability with Army Soldiers in

FY05 and an engagement capability in FY07. The first THAAD battery (-) will begin fielding in FY09 with a second in FY11.

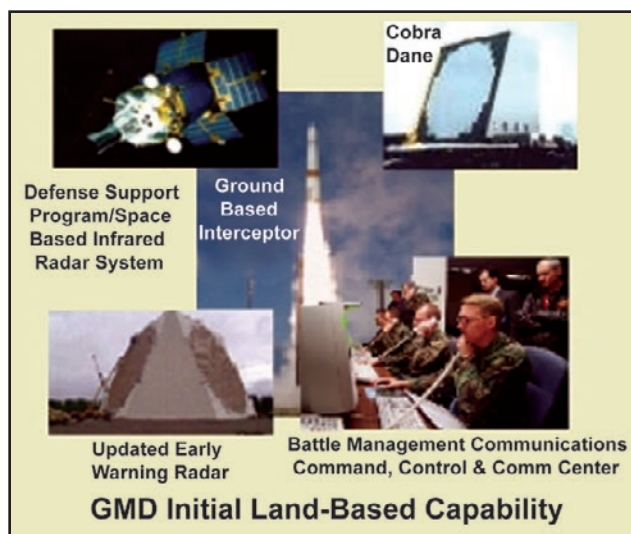
### **Surface-Launched Advanced Medium-Range Air-to-Air Missile (SLAMRAAM)**



**Description.** SLAMRAAM will defend designated critical assets and maneuver forces against aerial threats. It will replace the Avenger in the Army's AMD force and is being developed in concert with the USMC's CLAWS system. SLAMRAAM is a lightweight, day-or-night, adverse-weather, NLOS system for countering CMs, UAVs, RSTA platforms, and rotary and fixed-wing threats with engagement capabilities up to 30 km. The system consists of SLAMRAAM components—a HMMWV-mounted launcher platform; launch rails; launcher electronics; onboard C4 components; and AIM-120 Advanced Medium-Range Air-to-Air Missiles (AMRAAMs), supported by the Sentinel Enhanced Target Range Acquisition Classification (ETRAC) sensor, which is linkable to other joint and Army external sensors.

**Program Status.** The SLAMRAAM entered the SDD phase in Sep 03. It is funded for development and fielding of one battery in FY06 and one battalion in FY08.

## **Ground-Based Midcourse Defense (GMD)**



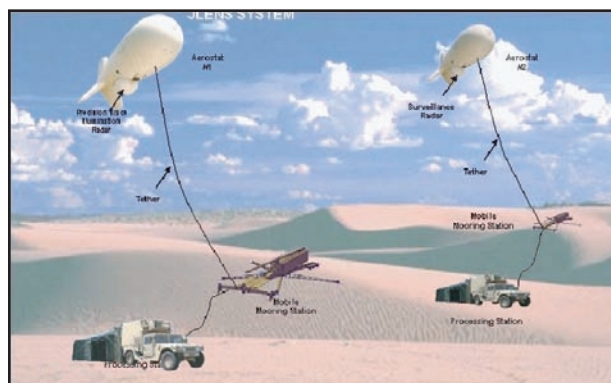
**Description.** GMD is a fixed, land-based system designed to provide limited protection to the United States against an intercontinental ballistic missile (ICBM) attack. The GMD design focuses on ensuring high defense effectiveness against ballistic missile attacks of limited scope (e.g., accidental, unauthorized, or authorized limited launch). The GMD SoS architecture consists of the following components: GMD Communications Network (GCN), GMD Fire Control (GFC), Missile In-Flight Communications, and Ground-Based Interceptors (GBI). GMD is part of a SoS architecture that includes Upgraded Early Warning Radars (UEWR), X-Band Radars (XBR), Aegis and the Space-Based Infrared System (SBIRS).

**Program Status.** GMD is an element of the MDA's broader Ballistic Missile Defense System (BMDS), a capabilities-based developmental acquisition program utilizing a block approach. The Army has served as lead Service for GMD (less acquisition) since 1999, and today has focused its efforts on providing installation support, facilities, resources, force protection and operational personnel in support of the deployment of a capability for

limited defensive operations in 2004 with an additional mission as a developmental test bed. The Strategic Planning Guidance directs the MDA to develop options for expanding GMD beyond the test bed.

**Sensors:** Elevated and ground-based sensors provide effective detection of all aerial threats and work with Future Force capabilities to provide enduring, persistent surveillance and third-dimensional situational awareness. The Army has two sensor programs in JLENS and Sentinel that are key components of the joint integrated AMD architecture. Shooter sensors (Patriot, MEADS and THAAD) also feed into the joint, fused, integrated third-dimensional network. Joint interdependence—JLENS provides the only long-endurance, elevated sensor capable of providing fire control quality data throughout the joint network.

## **Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS)**



**Description.** JLENS is an Army-led, joint program employed with a theater or UE organization. JLENS is an elevated, long endurance system that uses advanced sensor and networking technologies to provide 360-degree Wide Area Surveillance Radar and Precision Track Illumination Radar (PTIR) against the land attack cruise missiles (LACMS) threat and can also serve as a long-endurance communications relay. JLENS enables joint and

Army AMD SoS to conduct BLOS and NLOS engagements against aerial targets out to each respective interceptor's maximum effective kinematic range and to enable engagements in clutter. JLENS provides detection and tracking of fixed- and rotary-wing aircraft, UAVs, TBMs in boost phase, and surface moving objects when performing a selective moving target indicator (SMTI) mission. JLENS directly supports all facets of joint theater AMD (JTAMD) active air defense and contributes to offensive counter air (OCA)/attack operations and C4I through multi-link dynamic data distribution. JLENS supports JTAMD mission set execution by providing surveillance and supporting integrated fire control (IFC), and aerial CID activities. JLENS is a major contributor to the JTAMD Capstone Requirements Document (CRD) objectives of SIAP and CID, providing precision tracking and measurement information. As a key element of the SIAP, JLENS integrates data from multiple sensors and C3I networks and provides correlated data to BMC4I nodes. JLENS is less expensive to buy and operate than fixed-wing aircraft and can stay aloft for up to 30 days, providing 24-hour battlespace coverage over extended areas.

In Dec 02, the VCSA tasked Army material developers, in coordination with the REF, to determine what material solutions could be made rapidly available to improve force protection for Soldiers in Afghanistan and elsewhere. In response to the VCSA initiative, the JLENS project office proposed, developed and deployed three force protection packages known as JLENS Rapid Aerostat Initial Deployment (RAID) to Afghanistan in support of OEF in Mar 03 for \$6.1 million. These elevated, multispectral sensor systems were fully operational by early Apr 03.

The JLENS RAID system consists of three main components:

**Platform.** AB-1309, 117-foot tower or 15-meter aerostat (work is being conducted for an airship platform).

**Sensor.** Provides 24/7, 360-degree visual coverage with an electro-optic (EO) color daytime camera, an infrared black/white day or night camera, and a laser range finder with pointing azimuth indicator for precisely locating targets of interest out to 13 km (personnel) or 20 km (vehicles), allowing the commander in the field to respond in a timely, safe and appropriate manner.

**Ground Control Station.** For sensor display and control with video recording/playback capability EO/IR fully passive sensor system, color EO daytime and black/white IR day or night capability with laser range finder, and pointing azimuth indicator.

**Program Status.** JLENS is a key component of the Army's cruise missile defense (CMD) acceleration initiative, developed as a joint solution in an SoS framework, to provide combatant commanders with an increased CMD contingency capability by FY08, with FUE in FY10. JLENS is being developed, demonstrated and procured using an evolutionary acquisition strategy consisting of spirals and increments. Each increment is traceable to the ORD block requirements (e.g., Increment 1 is equivalent to ORD Block I). Increment 1 consists of two spirals; each spiral is being constructed to support air directed surface-to-air missile (ADSAM) engagements, SIAP and CID capabilities. Increment 2 will provide an increased fire control radar capability and a wide area surveillance capability with each sensor hosted on a nontethered platform. Increment 3 provides an increased system capability with sensors hosted on a nontethered, single platform for high mobility. A Milestone B decision is scheduled for

FY05, and a Milestone C decision is expected in FY09.

Due to the success of the RAID effort, funding in the amount of \$38.3 million for 18 additional units was part of the \$87 billion FY04 supplemental spending bill passed by Congress for support of OEF, OIF and Noble Eagle.

### **Sentinel**



**Description.** Sentinel is a trailer-mounted radar system that detects, tracks, classifies and identifies CMs, UAVS, helicopters and fixed-wing aircraft to cue short-range air defense weapons. Sentinel is a key part of Army modular force conversion providing airspace management and third dimensional capabilities to the Army's UExs. It is employed in the division and corps areas and is C-130 deployable. Data is passed through the Forward Area Air Defense Command and Control (FAAD C2) to short-range air defense weapons. The Sentinel is comprised of a radar-based sensor system with its HMMWV prime mover, power, IFF, and command and control interfaces. The antenna/transceiver group has an advanced three-dimensional battlefield air defense radar housed aboard a light tactical trailer (LTT) chassis. The radar employs a modern phased array antenna that automatically detects, tracks, classifies,

identifies and reports targets. Targets can be hovering or fast moving, from nap of the earth to the maximum engagement altitude of short-range weapons. The radar operates in the X-band, transmitting 1,100 pencil beams per rotation. It rotates at 30 rpm (two-second update). The instrumented range and altitude are 40 km and 4 km, respectively. The Sentinel data utilizes SINCGARS AN/VRC-92A and EPLRS AN/VSQ-2 radios. These can provide a track file of more than 60 targets. Sentinels will be in the composite battalions, providing 360-degree surveillance to counter CMs, UAVs other ABT threats, enabling Avenger today and SLAMRAAM in the future to defeat those threats.

**Program Status.** The program completed its primary Sentinel procurement in FY01 and is currently undergoing preplanned product improvement (P3I) to improve surveillance and tracking capabilities. Sentinel completed fielding to Active Army and National Guard units in FY03. Additional upgrades and system modifications are currently scheduled through FY08 for many AC and RC units to take advantages of advances in technology and software upgrades. ETRAC modifications will be applied to 20 radars by FY05. The ETRAC modifications consist of two upgrades: Phase 1A improves the radar detection range against low-observable and stealthy targets; Phase 1B improves the radar classification of low-observable and stealthy targets at extended ranges. The Phase 1B capability for target airframe classification will support the joint identification and target classification function that allows short-range weapons to operate at maximum effectiveness.

**BMC4I.** Integrated BMC4I provides the AMD SoS backbone. Without the ability to provide fused, near real-time information with fire control quality data, Army AMD SoS will not

be able to provide such key AMD capabilities as BLOS or wide area engagements. There are no BMC4I systems that can provide fire control quality data throughout the SoS. Development of a SIAP or integrated fire control capability evolution may eventually provide a single BMC4I solution among the Services and the Joint Force, but that capability has not yet been developed, planned or programmed.

### **Air Defense and Airspace Management (ADAM) Cell**

**Description.** The ADAM Cell consists of six air defenders and aviators and is organic to the BCT and SBCT HHC. The ADAM Cell is equipped with an Air and Missile Defense Work Station (AMDWS), an Air Defense System Integrator (ADSI), Tactical Airspace Integration System (TAIS) Airspace Workstation (AWS) and Forward Area Air Defense Command, Control, and Intelligence (FAAD C2I) processor. The mission of the ADAM Cell is to conduct continuous AMD planning and coordination and maintain aerial situational awareness proportionate with the service sensors deployed within the brigade area of operations (AO). The ADAM Cell also provides the commander and staff with the aerial component of the overall COP. As the operation evolves, the ADAM Cell works continuously with the staff to ensure the commander's intent, with respect to aerial situational awareness and defenses, is executed. The ADAM Cell continuously monitors the AMD situation and conducts METT-TC analysis to achieve situational understanding of friendly and enemy third dimensions.

**Program Status.** ADAM Cells are fielded to SBCTs serving in Iraq and are scheduled to be fielded to BCTs and select divisional headquarters deploying to Iraq. Currently, modular force conversion requirements are seven per

UEX. Within the UEX, ADAM Cells are located in Tactical Command Posts One and Two—one per each of the four BCTs and one in the fires brigade. Consideration is being given to ADAM Cells for each modular aviation, maneuver enhanced (ME) and RSTA brigade. To date, 34 of the currently required 127 ADAM Cells have been resourced through FY10. Another 32 have been identified as part of the FY05 supplemental reprogramming action. Seven have been fielded, and five additional ones will be fielded by Dec 04.

### **Joint Tactical Ground Station (JTACS) Multi-Mission Mobile Processor (M3P)**



**Description.** The Multi-Mission Mobile Processor (M3P) is a P3I of the current, operationally proven JTACS system. JTACS M3P is being acquired as part of the mobile ground segment for the Space-Based Infrared System (SBIRS), the successor to the Defense Support Program (DSP). JTACS M3P is a transportable missile warning and communications system that receives and processes direct downlink raw data from DSP and SBIRS sensors. The capability supports simultaneous operations in multiple theaters and provides the theater combatant commander with organic in-theater tactical ballistic missile threat warning. In addition, the JTACS M3P with the SBIRS sensors will

provide battlespace characterization data for situational awareness. JTAGS M3P will interface with DCGS-A to provide warning and situational awareness data down to the tactical command level. The JTAGS M3P data processor and communications equipment are contained in a 42-foot van and includes two 100-kW generators, three 5-ton cargo trucks, one 5-ton tractor, three tri-band antennas and one HMMWV. The JTAGS program has incorporated a block acquisition approach to upgrade the M3P configuration and meet objective performance requirements. This approach secures an evolving and increasing capability to access the similarly evolving data provided by DSP sensors as the SBIRS constellation replaces the aging DSP inventory. Block 1 maintains supportability and DSP compatibility by upgrading the JTAGS to the M3P configuration.

**Program Status.** The Army will replace the five fielded DSP-compatible M3P systems, of which three sections are permanently forward deployed, beginning in 1QFY06. The Army-approved requirement calls for a JTAGS M3P force of three full detachments (six sections total). The sixth section is currently not funded. The transition to Block 2 will occur as the SBIRS High Earth Orbit (HEO) and Geosynchronous (GEO) satellites are launched and assume operational capability. With the SBIRS program replanning underway, Block 2 implementation has not been approved. However, application of the upgrades to the Army M3P systems is projected to begin in FY11. M3P Block 3 is planned to incorporate data from the technologies developed by the MDA and their development efforts with the Space Tracking and Surveillance System (formally SBIRS Low). MDA is conducting technology demonstrations that will lead to a Low Earth Orbit (LEO) constellation that will support the Ballistic Missile Defense System and strategic and tactical missile warning.

### **Air and Missile Defense Command and Control System (AMDCCS)**



**Description.** The AMDCCS provides both command and control and a sensor-to-shooter link for Army AMD operations and is the current backbone for Army AMD command and control systems. It consists of two components: FAAD C2 and the Air and Missile Defense Planning and Control System (AMDPCS). AMDCCS automates C4 and ISR digital linkages; integrates AMD sensors, weapons and C3I systems; and interfaces with the Army Battle Command System (ABCS), Global Command and Control System (GCCS), and joint and allied battle management systems. It provides selected AMD elements a fire control system via the ADSI for monitoring and controlling engagement operations by subordinate battalions. AMDCCS provides a common AMD staff planning and battlespace situational awareness tool via the Air and Missile Defense Workstation (AMDWS), which presents airspace situational understanding to Army commands. AMDWS also enables Army interoperability with joint theater AMD forces. AMDPCS is the foundation for the ADAM Cell, a critical component of the maneuver commander's ability to execute effective Army airspace command and control (A2C2).

**Program Status.** FAAD C2 is an Acquisition Category (ACAT) II program in procurement with an Aug 95 approved ORD. AMDPCS is an ACAT III program with a May 97 approved ORD currently under revision. The FY06-11 program plan funds both FAAD C2 and AMDPCS to provide AMDCCS to all SBCTs, selected AC and RC modularly configured BCTs, and UEx headquarters and ARNG Avenger battalions.

## AMD Summary

AMD Future Force organizations and systems reflect the culmination of ongoing system improvements, new system capabilities and state-of-the-art technologies. They will be modular, highly mobile, tailorable and interoperable with Army, joint and multinational forces and interagency team members. They will be fully capable of proactively protecting joint forces, providing aerial situational awareness, and contributing to airspace management across the range of military operations. Future Force AMD systems development and subsequent resourcing challenges the Army to pursue and analyze technologies that support valid operational concepts and doctrine. This ongoing analysis will ensure the Army funds effective DOTMLPF solutions that optimize capabilities for the Future Force.

## Space Capabilities Enabling Force Protection

In addition to AMD and CBRNE capabilities supporting force protection, military dependence on such space force enhancement capabilities as position, velocity, navigation, timing services, ISR, communications and weather, terrain, and environmental monitoring (WETM) data continues to grow. Space control is an evolving facet of force protection that helps assure access to these capabilities while denying adversaries the same, thus

facilitating freedom of action for maneuver forces and space assets. It involves four interrelated objectives:

- Surveillance of space assets to understand their mission and operations as well as threat characterization and rules of engagement (ROE) validation
- Protection (defensive or offensive) of space systems from hostile actions
- Prevention (active or passive) of unauthorized access to and exploitation of space systems
- Negation (deny, disrupt, deceive, degrade or destroy ground or space assets or communications links between them) of hostile space systems that place the combatant commander's interests at risk

Our ever-increasing reliance on space, combined with the advantages an adversary can garner from both foreign government and commercial space capabilities, makes space control a long-term operational priority.

The Army contributes to the nation's space control capability through use of the ground-based space surveillance systems on Kwajalein Atoll. When not committed to Ballistic Missile Defense research and development, these radars help the U.S. Strategic Command identify and characterize potential adversary space capabilities. Tactical surveillance capabilities are also being developed to enhance support to ground maneuver forces. Additionally, the Army is currently using Big Crow, operated by the Army Space and Missile Defense Command (SMDC)/Army Strategic Forces (ARSTRAT) Space Electronic Warfare Detachment (SEWD), as a space control asset to support current operations. Big Crow is a multifaceted electronic warfare (EW) test bed capability that assesses and

stresses space control systems in development that also has operational applications. The Army is conducting S&T and RDTE efforts, developing doctrinal, organizational and operational concepts; and planning an acquisition strategy to bring new space control capabilities to the warfighter. The Army is also partnering with sister Services to pursue terrestrial-based space control solutions for direct Army and Joint Force support.

### **CBRN Defense Capabilities**

The Army's dedicated chemical, biological, radiological and nuclear (CBRN) defense units; corps of trained defense experts; and enhanced NBC medical treatment capabilities, significantly mitigate the effects of threat CBRN weapon employment. The Army's concept to employ "focused defense" against CBRN weapons enables units to operate at the lowest required protective posture without increasing risk to the Soldier. CBRN reconnaissance and surveillance units, with their point and standoff detectors and battle management/C2 procedures, are the principal means of contamination avoidance. This protection extends throughout the full spectrum to include homeland defense. The Army is augmenting installation commanders with the ability to respond to terrorist and CBRN attacks through dedicated force structure and training.

The Army activated the 20th Support Command (CBRNE) in Oct 04. This headquarters is a "one-stop shop" for CBRNE matters. They will integrate, coordinate, deploy and provide trained and ready forces to respond to CBRNE incidents both at home and abroad. They will command and control both explosive ordnance disposal and technical escort units.

CBRN defense systems, obscurants and their enabling technologies allow the Army to fully achieve force protection, information dominance and full-dimensional protection in a WMD environment. The Army's CBRN defense strategy is to employ a focused defense against CBRN threats so that only units directly affected by the hazard would be warned to take protective measures. Using focused defense, large numbers of units will no longer assume a full protective posture as a precautionary measure. Focused defense allows units to operate in the lowest required protective posture without unacceptably increasing the risk to Soldiers. The Army's obscuration strategy is to deny the threat's use of the electromagnetic spectrum while preserving our ability to exploit it at will.

In addition to providing the means of general CBRN defense and obscuration common to all units, the Army provides increased CBRN defense and obscuration capability with specialized chemical units. CBRN reconnaissance and surveillance units, with their point and standoff detectors, are the principal means of contamination avoidance. Decontamination units restore combat power after resources (personnel, equipment and facilities) are contaminated. Biological detection units provide capabilities to shorten response time to initiate their medical response to the growing threat of biological warfare (BW) agents. Information dominance is supported through development and employment of obscurants that are effective in the visual, infrared and millimeter ranges.

The CBRN defense mission area also includes the Army's efforts to address homeland security. Today, the nation recognizes that CONUS installations and power projection platforms are no longer a sanctuary. The very ability to execute our force projection strategy requires CBRN-focused defense over strate-

gic forces and the means to employ them from premobilization through conflict termination and demobilization.

*Chemical Vision 2010* is the implementing vision of the Army's CBRN defense modernization effort. It enables the commander to minimize casualties and preserve combat power in a CBRN environment and to create information superiority by using obscurants. Operationally, if the enemy has an offensive CBRN capability, our primary goal is to deter threat use. If deterrence fails, our mission is to defend against a CBRN attack with minimal casualties and degradation, allowing commanders to quickly restore full combat power and continue their mission across the full spectrum of operating environments.

The principles of CBRN defense in *Chemical Vision* are sense, shape, shield and sustain. The principles of obscuration are sense, shape, shield, attack and deceive. These principles support the patterns of operations in *Army Vision 2010* (protect the force and information dominance) and the principles in *Joint Vision 2020* (full-dimensional protection and information operations).

In providing the CBRN defense and obscuration systems for the Army's transformation strategy, the Army will equip its specialized chemical units and provide CBRN defense and obscuration items common to all units in accordance with the three tenets of the Army's overall modernization strategy (1) focusing its S&T efforts on the Future Force, (2) meeting immediate SBCT operational needs, and (3) maintaining and improving the warfighting capabilities of the rest of the Current Force through a judicious combination of selected modernization, recapitalization and sustained maintenance of essential systems. The following paragraphs elaborate on some of the key CBRN systems in the Army's moderniza-

tion plans, although additional systems are also under development.

## Key CBRN Modernization Programs

### M31/M31A1/M31E2 Biological Integrated Detection System (BIDS)



**Description.** The BIDS is a collectively protected shelter mounted on a dedicated vehicle (M1097A1 HMMWV) and equipped with a biological detection suite employing complementary technologies to detect large area biological attacks. The P3I BIDS is capable of detecting all types of BW agents in less than 10 minutes, and identifying any eight agents simultaneously in less than 30 minutes.

**Program Status.** The NDI and P3I versions of the BIDS have been fielded. The M31E2 version is being fielded with a projected completion in FY05.

### Stryker-NBCRV

**Description.** The Stryker-NBCRV will incorporate the Block II NBCRV integrated chemical and biological point detectors that will allow on-the-move standoff biological and chemical agent detection. The Chemical Biological Mass Spectrometer (CBMS) Block II will improve the detection and identification of liquid chemical agents while providing a

first-time biological agent detection capability to the reconnaissance platform. The Block II sensor suite will automatically integrate contamination information with data from onboard navigation and meteorological systems and rapidly transmit contamination hazard and clear area intelligence to the appropriate operations center. Integration of the common CBRN technical architecture will allow for expansion/upgrading of the onboard computers at minimal cost, as well as the command and control of CBRN-sensing UAVs and unmanned ground vehicles (UGVs) in the Future Force system.

**Program Status.** Stryker-NBCRV Milestone C was reached in 4QFY04 and this allows the start of LRIP. Production verification testing and initial operational test and evaluation (IOT&E) are planned for FY06-07. The FY06-11 plan funds Stryker NBCRV fielding to all SBCTs.

#### **M56 Wheeled Smoke System (Coyote)**

**Description.** The M56 Coyote provides large area multispectral screening for maneuver and support forces from the M1113 HMMWV. The M56 Coyote can generate large area obscurants throughout the battlespace to counter enemy reconnaissance, surveillance and target acquisition systems. Missions include providing static and mobile visual, infrared and/or millimeter wave (MMW) screening in the form of a haze, blanket, and curtain. Major components include a turbine smoke generating system. It has the capability of providing continuous visual smoke for up to 90 minutes and 30 minutes of infrared screening smoke. A P3I will add a 30-minute millimeter wave obscuring capability to defeat enemy radar RSTA devices and weapon systems. A two-person crew operates the M56 and has the capability to counter the threat arising from

the wide proliferation of advanced visual and IR sensors.

**Program Status.** Fielding of the M56 continues through FY05. Application of the MMW P3I begins in FY06 with the application of modification kits to previously fielded systems. A total of 241 systems will be upgraded with the MMW kit. The Army Acquisition Objective of 265 has been met.

#### **Vehicle Obscuration Smoke Systems (M6 and M7)**

**Description.** Vehicle obscuration smoke systems provide an immediate smoke screen that can obscure threat surveillance, target acquisitions, and weapon guidance systems in the visual through the infrared spectrum. The system provides approximately 20-120 seconds of obscuration, which enables the vehicle to maneuver out of the immediate threat area. The M6 countermeasure discharger is installed on Stryker platforms to provide this capability. The M7 Light Vehicle Obscuration Smoke System provides this capability for Up-Armored HMMWVs. Both systems utilize 66 mm grenades and a launcher configuration of four tubes. Multiple launcher systems are utilized to provide all-around screening capability.

**Program Status.** The M6 program is currently funded to equip all SBCTs. The M7 is not currently funded to fulfill all requirements for FY05.

#### **Chemical Biological Protective Shelter (CBPS)**

**Description.** CBPS consists of a lightweight multipurpose shelter (LMS) mounted on an expanded-capacity HMMWV variant and a 300-square-foot air beam supported soft shelter. CBPS provides a contamination free, environmentally controlled working area for



medical, combat service and combat service support personnel to obtain relief from the continuous need to wear chemical-biological protective clothing for 72 hours of operation. All ancillary equipment required to provide protection, except the generator, is mounted within the shelter.

**Program Status.** CBPS is currently undergoing a P3I to upgrade the system to a nonhydraulic system. CBPS received full materiel release in Oct 03. Field continues through FY11.

#### **Collectively Protected Deployable Medical System (CP DEPMEDS)**



**Description.** CP DEPMEDS enables field combat support hospitals (CSH) to sustain medical operations in a CB environment for 72 hours. CP DEPMEDS provides a clean, toxic-free, environmentally controlled patient treatment area, maximizing the use of existing equipment to the hospital unit base of fielded deployable medical systems/medical reengineering initiative CSHs for the Army.

The program is a multi-Service effort between the Army and Air Force. All Services use field hospitals, which are comprised of the same building block components. Hospitals vary in size and configuration between the Services. Collective protection is provided through the addition of M28 Collective Protection Equipment (CPE), CB-protected environmental control units and heaters, CB-protected latrines and water distribution systems; low-pressure alarms and other integration components necessary for a fully operational CB-protected hospital facility. All components are designed to integrate into fielded hospitals. Components will be packaged as a set to be provided to units fielding to threat areas. The CP DEPMEDS is installed during set up of the hospital.

**Program Status.** The FY06-11 program plan supports procurement of an additional eight systems bringing the total procurement to 20 systems. CP DEPMEDS will be prepositioned to support rapid deployments and placed in Army War Reserve.

#### **Sorbent Decontamination System, M100**

**Description.** The M100 Sorbent Decontamination System (SDS) is intended to replace the M11 and M13 Decon Apparatuses: Portable (DAPs) currently employed in operators' spray-down operations associated with immediate decontamination. The M100 SDS uses a reactive sorbent powder to remove chemical agent from surfaces. Use of the M100 SDS decreases decontamination time and eliminates the need for water.

**Program Status.** With initial issue complete, the M100 is now available for purchase using normal supply channels.

### **Joint Portal Shield Detector System (JPS)**



**Description.** The Joint Portal Shield (JPS) is DOD's first automated networked biological detection systems. The system uses an innovative network of sensors to increase probability of detecting a BW attack while decreasing false alarms and consumables. The JPS system can detect and presumptively identify up to eight BW agents simultaneously in less than 25 minutes.

**Program Status.** JPS operates in Korea and Southwest Asia. Twelve additional sites have been directed by the Deputy SECDEF for Pacific Command and Central Command combatant commanders. The Defense Emergency Response Fund (DERF) funds the upgrade of 237 fielded portal shield units with Biological Aerosol Warning Sensor (BAWS). Fifty-four additional units will be procured as part of CB Installation Protection Equipment.

### **Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)**

**Description.** JSLSCAD is a lightweight, passive, standoff and chemical agent detector capable of providing up to 360-degree, on-the-move vapor detection from a variety of tactical and reconnaissance platforms at

distances up to 5 km. Enhanced early warning for contamination avoidance is the competency of the system. When avoidance is not possible, JSLSCAD will provide extra time for Soldiers to don full protective equipment.

**Program Status.** The JSLSCAD is in a five-year developmental effort that includes ground-, air- and sea-based platforms. Increment I provides initial capability to the Stryker-NBCRV and the JSLNBCRS. Increment II will seek a commercial off-the-shelf solution to support all ground mobile, fixed site, and shipboard applications, achieving FRP in FY08. Increment III will integrate and test the Increment II design into aerial platform applications.



### **Joint Service Lightweight NBC Recon System (JSLNBCRS)**

**Description.** The JSLNBCRS is a HMMWV- or armor-based system that will provide rapid, on-the-move (up to 45 kph), standoff-and-point chemical agent vapor detection; on-the-move, point chemical agent liquid detection and identification; stationary point biological agent detection and identification; nuclear/radiological detection, warning, marking and solid/liquid sample collection capabilities on a host platform that is capable of protecting the



crew from chemical and biological hazards. The JSLNBCRS is a detection system which is an integrated SoS consisting of an on-the-move, standoff chemical agent vapor detector; Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD) point chemical agent liquid/vapor detector/identifier; Chemical Biological Mass Spectrometer Block II (CBMS Block II), a dismountable handheld chemical agent monitor; Improved Chemical Agent Monitor (ICAM), a point biological agent detector/identifier; and Joint Biological Point Detector System (JBPDS), a CB agent sample collector; and fielded AN/VDR 2 and AN/UDR-13 radiological detectors mounted on a mobile platform. It supports contamination avoidance in the battlespace.

**Program Status.** IOC is scheduled for 1QFY05. FUE is projected for FY06.

#### **Joint Chemical Agent Detector (JCAD)**

**Description.** JCAD will be a combined portable monitoring and small point chemical agent detector for individual Soldier applications. This handheld, pocket-sized detector will be designed to automatically detect, identify and quantify chemical agents.



**Program Status.** Testing of candidate systems is underway at Edgewood Chemical Biological Center. Increment I fielding is scheduled for 4QFY07.

#### **Joint Warning and Reporting Network (JWARN)**

**Description.** The JWARN provides standard integration and analysis of NBC detection

information with command, control, communications, computers, information and intelligence (C4I2) on the battlefield. JWARN automates the NBC warning and reporting processes now performed manually throughout the Services. It will provide additional data processing, production of plans and reports, and access to specific NBC information to improve the efficiency of NBC personnel.

**Program Status.** Block I (D) software featuring some functionality has been fielded and is in use in many Army major commands (MACOMs). The JWARN IOC is scheduled for FY07 (objective)/FY08 (threshold). IOC shall be achieved when JWARN is fielded to initial units and training bases, unit personnel are trained, training base is established, and a maintenance system is in place.

#### **Joint Service Man-Portable Decontamination System (JSM-PDS)**

**Description.** JSM-PDS will be a man-portable system consisting of decontamination applicators and decontaminants, if required, for use primarily in immediate and operational decontamination operations/scenarios. JSM-PDS replaces the M11 and M13 DAP.

**Program Status.** IOC Increment I is scheduled for FY07. FOC Increment I is scheduled for FY08.

#### **Joint Service Sensitive Equipment Decontamination (JSSED) System**

**Description.** The JSSED provides the capability to decontaminate CB warfare agents from sensitive equipment, vehicle and aircraft interiors, and associated cargo that cannot be decontaminated and reused through current decontamination procedures. JSSED is required to reach contaminated areas of the equipment that are not accessible via a

surface wipe. JSSED will limit the transfer of contamination; restore mission essential functions; increase survivability; allow for lower levels of MOPP sooner; allow high-cost sensitive equipment to be reused instead of destroyed; and allow maintenance personnel to be able to work on the equipment without having to wear protective clothing.

**Program Status.** IOC is scheduled for FY09. FOC is scheduled for FY11.

### **Joint Service Transportable Decontamination System (JSTDS)**

**Description.** This mobile (tactical) system provides the capability to conduct operational and thorough decontamination of medium to large mobile or fixed equipment, aircraft, facilities, shelters, surface areas and terrain. This system will be vehicular mounted but may be dismounted for specific operations, thereby enabling the decontamination system to be moved to the equipment requiring decontamination. This system will be initially located in the UE to enable freedom of action by the UA as required. Specifically, this system will be a cross-spectrum system designed to support Current and Future Forces, or homeland security operations.

**Small-Scale System (JSTDS-SS)** replaces the M17 Lightweight Decontamination System (and M12A1 power-driven decontamination apparatus in non-SRC 03 units), and will be transportable via HMMWV/HMMWV trailer. It will be used during operational and thorough decon, and will come with a noncorrosive, nonhazardous decontaminant.

**Program Status.** Milestone B was signed on 1 Mar 04. Milestone C decision is scheduled for Sep 05. IOC is scheduled for FY07. FOC is scheduled for FY09.

**Large-Scale System (JSTDS-LS)** replaces the M12A1 Power-Driven Decontamination Apparatus in SRC 03 heavy decontamination units; and will be capable of decontaminating fixed sites, terrain, large aircraft and seaports of debarkation (SPODs)/aerial ports of debarkation (APODs).

**Program Status.** Milestone B was signed on 1 Mar 04. IOC of 350 systems is scheduled for FY07. FOC is scheduled for FY09.

### **Joint Service Personnel/Skin Decontamination System (JSPDS)**

**Description.** JSPDS replaces the M291 SDK and will decontaminate the skin and individual equipment and weapons of personnel and casualties, including those with wounds that have been exposed to CBRN warfare agents/contamination and toxic industrial materials/toxic industrial chemicals (TIMs/TICs) and nontraditional agents (NTAs). IOC is scheduled for FY07 and will be achieved when JSPDS is fielded to forward-deployed units, rapid deployment units and the training base; unit personnel are trained; a training base is established; and a maintenance system is in place. Total number of actual combat systems is 66,380.

**Program Status.** FOC is scheduled for FY09 and will be achieved when the JSPDS Army Acquisition Objective (AAO) is reached and all authorizations are filled. Total number of systems is 2,285,451.

### **Joint Service Sensitive Equipment Decontamination Joint Platform Interior Decontamination System (JSSED-JPID)**

**Description.** JSSED-JPID will be a family of applicators and decontaminants that will provide thorough decontamination capabilities in hostile and nonhostile environments. The

JSSSED-JPID systems will provide the ability to the Army to thoroughly decontaminate the interior of vehicles and aircraft which contain sensitive equipment (avionics, electrical, electronic, and environmental systems equipment) and the associated cargo. The use of rapid/effective decontamination systems to decontaminate vehicle and aircraft interiors that contain sensitive equipment will enable the warfighter to restore combat power if the interior of the platform becomes contaminated, and to continue their mission in lower levels or no MOPP. Thus the JSSSED-JPID system will significantly enhance the Future Force's ability to remain mission capable in a CBRN environment.

**Program Status.** The IOC for this system is projected in FY07, with FOC planned for FY12.

#### **Joint Service General Purpose Mask (JSGPM)**

**Description.** JSGPM is designed to replace the M40/M42 series mask. JSGPM will increase the Soldier's ability to perform mission essential tasks because physiological burdens such as breathing resistance will be substantially reduced, and the field of vision will be significantly improved. A key feature of the mask will be reduced weight and bulk.

**Program Status.** JSGPM replaces existing mask systems (M40/M42) at the end of their 10- to 15-year service life. Fielding is scheduled to begin in 4QFY06.

#### **Joint Biological Agent Identification and Diagnostics System (JBAIDS)**

**Description.** The JBAIDS program is the first effort by the DOD to develop and field a common medical test equipment platform among all the Services. JBAIDS is an evolutionary, three-block, reusable, portable and

modifiable biological agent identification and diagnostic system capable of simultaneous reliable identification of multiple biological agents of operational concern and other pathogens of clinical significance. JBAIDS Block I tests a variety of environmental samples and clinical specimens for nondiagnostic purposes, and performs confirmatory testing of samples collected by existing and future biological detection systems. Block II focuses on the militarization and hardening of critical toxin identification technologies based on a COTS/NDI candidate system. JBAIDS Block III is planned to be a handheld, FDA-approved device capable of providing the full range of biological agent identification and diagnostics.

**Program Status.** JBAIDS Block I is currently under development and testing, with a LRIP for 1QFY05. It is scheduled for an FRP decision in 4QFY05. Block II development is scheduled for FY07.

#### **National Guard Weapons of Mass Destruction Civil Support Team (WMD-CST) Unified Command Suite (UCS)**

**Description.** The UCS provides the WMD-CST with mission essential C4 support. The UCS capability includes state-of-the-art radio, satellite and cellular communications subsystems that will provide dedicated LOS and NLOS secure and nonsecure intra-team and intra-vehicular voice and data reachback. The UCS provides voice, data and video reachback capabilities to WMD-CST operations centers, incident command posts, and the various military forces, federal, state and local law enforcement and emergency service units that support domestic incident responses. These communications subsystems operate in handheld, base station and vehicle configurations capable of interoperating with military and commercial radio communica-

tions systems in various terrain and urban environments. This system is currently not overseas deployable.

**Program Status.** In production and fielded with National Guard WMD-CSTs throughout the United States.

**National Guard Weapons of Mass Destruction Civil Support Team (WMD-CST) Analytical Laboratory Suite (ALS)**

**Description.** The ALS provides the WMD-CST with a mobile laboratory capability that allows the CST commanders to analyze samples on-site in support to the first responder incident commander. The ALS is a mobile analytical laboratory capable of providing the CST a presumptive analysis for the presence of chemical, biological or radiological contamination. The ALS is a System Enhancement Program to replace the current Mobile Analytical Laboratory System and interim Dismounted Analytical Platform. The ALS provides advanced technologies with enhanced sensitivity and selectivity in the detection and identification of chemical warfare agents and toxic industrial materials.

**Program Status.** In production and fielded with National Guard WMD-CSTs throughout the United States. This system is currently not overseas deployable.

**CBRNE Installation Protection Program (IPP)**

**Description.** This program, initiated after the catastrophic attacks in 2001, will provide installations with an integrated and effective CBRNE installation protection capability consisting of CBRNE detection, identification, warning, protection, decontamination, information management, medical protection, surveillance and response. The program

objective is to improve the installation's emergency first responder capability and leverage existing physical security, logistics, sustainment, maintenance and C2 capabilities to maximize effectiveness while reducing the resource impact (time, funding and personnel) on the installation. This program is currently funded to address 62 of 187 Army posts.

**Program Status.** The first installations will be fielded with their initial CBRNE response capability sets in FY05. The remainder of the initial 62 installations will be equipped through FY11. The systems provided to the installations are not deployable.

## **CBRN Summary**

Among the significant changes to the future strategic environment, proliferation of WMD is recognized as a principal asymmetric threat capable of providing an adversary military advantage to neutralize overwhelming conventional superiority. Having an effective CBRN defense is a necessary component of any defense strategy that seeks to demonstrate to the adversary that use of WMD will not gain the advantage sought. Modernizing the force while conducting a robust S&T effort is critical to preventing technological surprise from new CB agents or different employment means. Recapitalizing and maintaining the Current Force is necessary to enable transformation and mitigates risk by extending the useful life of current systems within fiscal constraints. This modernization plan assures a disciplined approach to meeting mission-based requirements and secures orderly change as we transition to the Future Force.

## **Summary of Protection**

The Army's protection capabilities must continue to improve against an expanding,

significant threat arsenal, which includes information operations, terrorist attacks and other asymmetric threats. The Army's AMD and CBRNE defense modernization programs and leveraging of space-based protection assets are increasingly important to developing these protection capabilities. These critical systems and the sound, doctrinal operational concepts they support will mitigate these threats by improving freedom of action for friendly forces during deployment, maneuver, and engagement and providing better protection at all echelons, both at home and abroad. In this way, Army protection capabilities will enable force application capabilities of the Joint Force.

### Appendix 3: Focused Logistics (FL)

Focused logistics (FL) is the ability to sustain the Joint Force with the right personnel, equipment, supplies and support in the right place at the right time, and in the right quantities, across the full range of military operations. This is made possible through a real-time, web-based information system providing accurate, actionable visibility as part of a COP, effectively linking the operator and logistician across joint forces. Key support functions include deployment distribution, global mobility, ability to sustain the force and medical support to combat forces.

This appendix provides a brief discussion of the Army's FL capabilities that support required Joint Force capabilities and the key materiel programs associated with these capabilities. Highlighted are improvements to the deployment distribution process, the equipment-lift capabilities necessary to make the Army more strategically responsive, and key materiel programs that provide assured mobility and force sustainment.

### Protecting Tactical Wheeled Vehicles

As an important part of the Army's responsibility to sustain the Joint Force with equipment and directly related to the critical requirement to provide protection against an adversary's effect on that force, the Army has initiated an aggressive approach to protect its tactical wheeled vehicles. The highest priority is to provide such protection to our forces involved in ongoing operations in Iraq and Afghanistan, though integrated efforts will be both short and long term in their impact. The immediate goal is to provide by Jun 05 some type of armor protection to all tactical wheeled vehicles operating in these theaters. To help accomplish this, the Army has established an Armoring Task Force with the purpose of identifying requirements, developing an integrated strategy, determining ways to accelerate production and installation of armor solutions, determining funding solutions, and identifying a longer-term strategy.

The Army is using three distinct levels of armor protection that are being provided to tactical wheeled vehicles. The first category, level I, refers to fully integrated armor installed during production and retrofit. The second, level II, includes officially approved add-on armor kits that can be installed on vehicles, either in the United States or in the theater of operations. Finally, the third category, level III, includes locally fabricated armor using approved steel, which provides added protection as an interim measure until a level I or II kit can be applied. These various levels are being employed, along with ongoing efforts to assess and test other technological improvements, to ensure that all tactical wheeled vehicles involved in operational missions are equipped with the best protection available.

Considerable efforts as well as significant progress have been made in this endeavor since late 2003, and the pace has been accelerated in response to the rapidly changing operational requirements. The initial priority has been placed on up-armoring light tactical vehicles, primarily the HMMWV, by a combination of increased production and providing add-on armor kits for older vehicles. The requirement for armoring these vehicles has escalated dramatically from a few hundred in Mar 03 to over 8,000 by Dec 04, and the Army has already provided over 6,000 and expects to meet current requirements by Mar 05. The priority has now shifted to providing armor

protection for medium and heavy tactical wheeled vehicles, and these current requirements are due to be met by Jun 05.

The Army has developed a strategy for addressing and funding these urgent requirements in the near term and sustaining it over the longer term. A summary of the key elements of the strategy, the current requirements, and progress to date is shown in Figure D-8.

In addition to the essential materiel solutions to these operational requirements today, the Army is also fully involved in pursuing non-

**Key elements of strategy are:**

- Manage the apportionment of available up-armoring assets (kits, steel, glass and cabs) to ensure available assets are used in accordance with the supported commander's priorities.
- Strengthen manufacturing programs to ensure that each month we produce the maximum number of kits focused on key truck models.
- Establish a forum that links the support commander (USARCENT) and the force providers (FORSCOM, USAREUR, USARPAC) with AMC HQDA to ensure that the Army plans and executes a synchronized program.
- Communicate the tactical wheeled vehicle (TWV) up-armoring program so that senior leaders across the Army have common visibility of the TWV up-armoring program.
- Priorities are determined by ground commanders based on mission and risk regardless of component.

**Total requirement:**

- All wheeled vehicles in the area of responsibility will have levels I, II or III protection by Jun 05.
- 8,275 for up-armored HMMWVs (UAH) and 13,872 add-on armor kits for other HMMWVs.
- The medium and heavy tactical wheeled vehicle fleets require another 10,682 armor kits or cabs.
- All levels I and II vehicles will remain in theater as stay-behind equipment.

**Progress to date:**

- Completed over 22,000 vehicles in 14 months.
- 82 percent of the UAH requirement met. Continue to produce 500 UAH kits per month until the total requirement is met in Mar 05 and ramp from 450 up-armored vehicles per month to 550 per month.
- Producing 350 medium kits per month and ramping up to 1000 per month by April 2005. Production for heavy TWV kits will be completed in Feb 05 for HEMTT and HET and will continue at 400 PLS and M915 kits per month starting in Mar 05.

**Figure D-8. Protecting Tactical Wheeled Vehicles**

materiel measures that can directly improve the sustainment and protection of the Joint Force. These steps include the work of the Army-led JIEDD TF, which is working across the interagency and international spectrum on materiel and nonmateriel solutions to defeat this threat. Tangible results include effective countermeasures, fielding systems that increase detection and enhance detonation, and training solutions that increase awareness and incorporate lessons learned. In the end, this is and will remain a high-priority task for the Army and one that is fully integrated into equipping and operational requirements and responses.

### **Discussion of Key Equipment— Protecting Against IEDs**

#### **Warlock**

**Description.** Warlock is a family of systems designed to protect against remote-controlled improvised explosive device (RCIED) ambushes. It is a quick-reaction capability (QRC) currently providing force protection in Operation Iraqi Freedom and Operation Enduring Freedom. The Warlock establishes a limited protective “electronic bubble” for personnel and equipment. It is an SoS solution teaming intelligence, operations (tactics, techniques and procedures), training and materiel to mitigate the RCIED threat.

**Program Status.** Warlock is not yet a program of record and is not included in the FY06-11 program plan. This rapid fielding initiative program, led by the Joint IED Defeat Task Force (JIEDD TF) as the user representative, has received funding from congressional additions, the Iraqi Freedom Fund, the REF, and a DOD funding decision. Working against a rapidly evolving threat, the program manager, Counter-RCIED Electronic Warfare (CREW) is rapidly developing Warlock Spiral

II, estimated to begin production in 4QFY05, and has plans for Spiral III and Spiral IV to meet the needs of the Future Force. The Spiral I production will equip USCENTCOM with almost 8,200 Warlock devices by the end of 4QFY05, before Spiral II fielding begins.

### **Improving the Deployment Distribution Process**

The central responsibility of the Army under Title 10, U.S. Code, is to conduct prompt and sustained operations on land as a component of the Joint Force. Fulfilling this responsibility rests, to a very large extent, on the Army’s ability to rapidly project lethal, survivable and sustainable combat power as part of the Joint Force. While the Army is dependent to a large extent on Joint Force projection capabilities, we continue our own efforts to enhance our deployment capability and responsiveness while reducing our deployment requirements. Our efforts will continue to enhance our speed and agility in today’s threat environment.

We have increased our capabilities to defeat both anti-access and area-denial efforts through speed of deployments, leveraging information technology, modular force design, future concepts and improved equipment. The Army provides unique capabilities to gain, enhance and maintain assured access. We have reviewed the current security environment and initiated actions to reposition forces and equipment to support today’s security environment and tomorrow’s emerging threats. Forward-deployed forces, prepositioned stocks, regional bases/floatillas and facilities, assured access through standing agreements with allies and other nations, regional engagement by special operation and conventional forces, and multinational exercises are all instrumental in shaping a position of strength in a given region.

Improving deployment and sustainment of the force requires enhanced command and control and information systems that network and integrate information and data across the Joint Force. The Army continues to work toward this standard in our Future Force development. The Army currently has a number of automation systems, each with a joint foundation, that are designed to assist in the overall command, control, movement, and tracking of personnel and equipment during deployments and operations.

The design and emergence of systems such as the Global Combat Support System (GCSS) Army, Battle Command Sustainment Support System (BCS3), and Transportation Coordinators' Automated Information for Movement System II (TC-AIMS II) will enhance the deployment and sustainment of forces by facilitating the exchange of data between Army units and the combatant commanders, thus providing improved situational awareness and the ability to respond faster to unforeseen circumstances.

### Equipment Lift Capabilities

Extensive analysis and wargaming has shown that both current as well as many planned strategic and intra-theater air and sealift platforms do not support future warfighting concepts. Many current sealift platforms require deep-water ports to berth and off load. The availability of such ports is limited geographically to industrial nations and they are conspicuously absent in most nations south of the equator.

Further, the limited number of these ports makes them more vulnerable to many anti-access measures and jeopardizes the deployment of the joint warfighting force. Advanced sealift capabilities that provide for brown water and over-the-horizon sealift are

critical to support efforts designed to defeat anti-access and area-denial methods. High-speed, shallow draft vessels can leverage numerous ports in all areas of the world and thus support the concept of multiple, parallel seaports of debarkation, which is fundamental in overcoming anti-access challenges.

Existing strategic air platforms such as the C-5 Galaxy can carry enormous loads but are dependent on world-class airports for both embarkation and debarkation. The C-17 and C-130 provide the only capability today of bypassing these major chokepoints from appreciable distances while maximizing load capacities. Even so, they are still constrained to at least a 3,000-foot runway and in many cases (weather, terrain and environment dependent) may require 5,000-6,000 feet with sizeable loads. The venerable C-130 is further hampered by significant payload, altitude and range limitations and cannot be refueled in air. These capability limitations not only severely constrain our ability to execute assured access strategies, they demand a nearby intermediate staging base to transload equipment, personnel and sustainment from inter- to intra-theater lift platforms. None of the airlift platforms are suitable for air sustainment, nor can they support rapid shift of maneuver forces and sustainment across the breadth and depth of the battlespace.

To overcome the limitations of these strategic air platforms, larger capacity Super Short Takeoff and Landing (SSTOL) and/or Heavy Lift Vertical Takeoff and Landing (HLVTOL) platforms are required in substantial quantities for air movement of the Future Force. Shallow draft high-speed sealift and advanced, intra-theater sealift designs are required for austere seaport access. Whether the goals encompass operational maneuver from strategic distances, use of multiple simultaneous austere points of entry, vertical maneuver and

envelopment, dominant maneuver, precision engagement and focused logistics, SSTOL and HLVTOL technology solutions are needed sooner rather than later.

These kinds of platforms further provide a quality of versatility and adaptability necessary to enable Army and joint force commanders to adjust movement of forces and sustainment in stride in response to the evolution of the campaign and the enemy's own actions. Funding the S&T and procurement required to bring advanced lift capabilities to the Joint Force is a joint challenge. The Army alone cannot develop, procure and field such systems due to both budgetary and regulatory constraints. Instead, the Army encourages joint S&T emphasis on the following efforts.

#### **Shallow Draft High-Speed Ship (SDHSS).**

An SDHSS is a strategic ship that can deliver troops, equipment, and sustainment together in sufficient size and at a considerable speed to provide immediate combat power to the joint force commander. Because it has a shallow draft feature, it can bypass established seaports and discharge its combat power wherever there is at least a 10-foot draft and an acceptable offload site. With a C4I suite onboard, commanders can conduct en route planning, receive intelligence updates, and integrate with the joint force commander.

#### **Super Short Takeoff and Landing (SSTOL)**

**Aircraft.** The SSTOL is a joint aircraft with the ability to carry two FCS platforms 3,500 miles. It can land on 750 feet of road or field in the joint area of operations, which avoids fixed airfields and adds innumerable points of entry. It provides the joint force commander the ability to achieve operational surprise.

**Heavy Lift Vertical Takeoff and Landing (HLVTOL) Aircraft.** The HLVTOL is an aircraft with the ability to deliver one FCS

within a radius of 1,000 miles. The ability to insert combat vehicles vertically gives the commander unparalleled speed and agility. Generally independent of ground conditions, it enables the joint force commander to conduct vertical envelopment and vertical maneuver, as well as the ability to avoid predictable, linear patterns of operation. It also offers significant benefits to vertical joint logistics over-the-shore.

### **Discussion of Key Equipment-Lift Materiel Programs**

#### **Joint High Speed Vessel (JHSV) (formerly the Theater Support Vessel (TSV)**



**Description.** The JHSV is the operational version of the strategic SDHSS. It is another source of flexibility and agility within a theater as it allows the joint force commander to insert combat power and sustainment into austere ports worldwide. Supporting APS and Joint Logistics Over-the-Shore (JLOTS), the JHSV expands the reach and possibilities of prepositioning both on land and afloat. The JHSV is a high-speed, 40+ knots, shallow draft sealift platform that will maximize current commercial ferry technology. The JHSV provides the capability to conduct operational maneuver and repositioning of intact unit sets while conducting en route mission planning and rehearsal. This intra-theater vessel provides the combatant commander with increased

throughput, increased survivability, increased responsiveness and improved closure rates. This transport transformation enabler helps obtain force deployment goals as well as achieving full distribution-based logistics.

**Program Status.** The Department of the Army and Department of the Navy are combining their requirements in accordance with the JCIDS, merging the Army's TSV and the Navy's High-Speed Intra-Theater Surface Connector programs. Although the Army initially determined a requirement for 24 vessels and a critical requirement for 12 vessels, a joint requirements and solution set has not yet been determined. To insure joint interoperability, minimize redundant capabilities and gain economies of scale, the Army, Navy and Marine Corps have signed a Memorandum of Intent to transfer the acquisition lead for the Army program to the Navy. The plans for funding the JHSV program will be determined as part of the joint acquisition process that will be executed by the acquisition team and the program office, led by the Department of the Navy, in close coordination with the Department of the Army. An ACTD is ongoing and scheduled for completion at the end of FY05.

### **Joint Precision Airdrop Systems (JPADS)**

**Description.** JPADS is a high-altitude-capable, autonomously operated precision airdrop system. The system consists of a family of different-sized airfoils, allowing airdrop of weight categories up to approximately 42,000 pounds. JPADS is not totally wind dependent and is releasable from altitudes up to approximately 35,000 feet mean sea level. Based upon winds and release altitude, 50 km standoff distances are also possible. Space-based GPS technology provides for aerial navigation/maneuverability throughout

descent, steering into the wind as necessary, and permitting highly accurate ground touch-down locations. JPADS is a critical logistics transformation enabler that facilitates dedicated aerial sustainment and helps achieve full distribution-based logistics.

**Program Status.** Program maturity for JPADS capabilities continues through FY05. The Milestone B decision for the 2,000-pound variant is scheduled for the second quarter of FY05. The 10,000-pound variant is expected to mature from ACTD to program management (PM) and is scheduled for a Milestone A decision in 1QFY05. In response to an Operational Needs Statement, the JPADS 2,000-pound variant was deployed to OIF with an urgent material release. The PM will leverage actual field experience and data to augment the system's upcoming test program.

### **Assured Mobility Capabilities**

The engineer future force will be organized, manned, equipped and trained to be more strategically responsive, deployable, agile, versatile, lethal, survivable and sustainable across the full spectrum of military operations. The future engineer force structure will be comprised of modular, scalable and flexible organizations for prompt and sustained land operations capable of quickly transitioning between changes in task, purpose and directions.

Assured mobility capabilities support force application by maneuver forces as well as focused logistics by sustainment forces. A critical factor in sustaining operations is the ability of forces to move and to properly maneuver over the depth and breadth of the battlefield while impeding, slowing or blocking our enemy's movement. Current operations in OEF and OIF highlight the enduring importance of systems that provide ground forces

the capability of detecting, defeating and emplacing minefields and other obstacle effects, allowing unparalleled freedom of maneuver and force sustainment. This capability supports the commander's dominant maneuver capabilities that are critical to gaining the positional advantage needed to retain the initiative and enhance joint precision fires as well as ensuring sustainment force movement remains effective across the distributed battlefield environment.

## **Discussion of Key Assured Mobility Materiel Programs**

### **AN/PSS-14 Handheld Standoff Mine Detection System (HSTAMIDS)**

**Description.** The AN/PSS-14 is a handheld mine detector capable of detecting metallic and nonmetallic antitank (AT) and anti-personnel (AP) mines. It combines ground penetrating radar (GPR) and an improved metal detection to provide a robust probability of detection for both large and small metallic and



nonmetallic AT and AP mines. The AN/PSS-14 significantly improves the detection of the smaller, low-metal AP mines by allowing the operator to tune out metallic clutter. The system requires 40 hours of operator training and frequent refresher training due to the erosion of skills over time. The systems will be fielded with complete training support package to include

a Sweep Monitoring System (SMS) and specially constructed training mine simulators.

**Program Status.** AN/PSS-14 entered low rate production in FY03 and achieved Milestone C in 1QFY04. The program is projected to receive full material release in Sep 05. Available systems are fielded to designated engineer units currently deployed or soon to deploy in support of OEF and OIF operations.

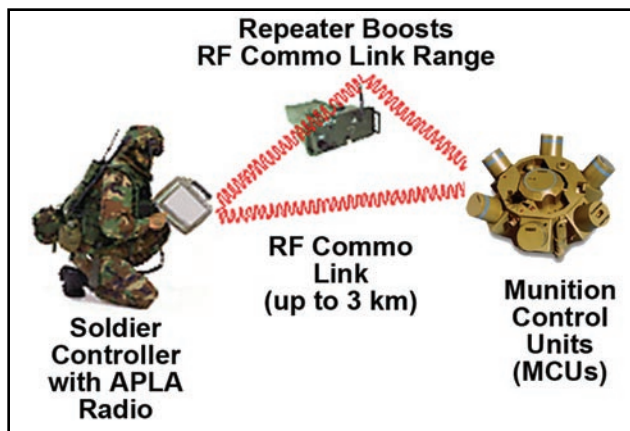
### **Ground Standoff Minefield Detection System (GSTAMIDS)**



**Description.** GSTAMIDS Block 0 is a route-clearance system capable of clearing a 20 km route in 12 hours using a remote-operated detection vehicle, the Buffalo Mine Protected Clearance Vehicle (MPCV), and a towing vehicle with proofing trailers. The detection vehicle utilizes a multisensor mine-detection suite consisting of metal detection, GPR, quadruple resonance and infrared to locate antitank mine types. The MPCV provides Soldiers a blast-protected vehicle from which to remotely operate the lead detection vehicle and mine-detection subsystems. GSTAMIDS FCS is a time-phased developmental program designed to provide the warfighter a capability to execute on-route countermine missions for the FCS. GSTAMIDS FCS will be employed on an overpass-capable countermine MULE variant UGV. The system will employ future improvements that will automatically detect, mark and neutralize all metallic and nonmetallic AT mines.

**Program Status.** Two GSTAMIDS Block 0 systems are currently fielded and supporting ongoing combat operations in OIF. GSTAMIDS FCS will begin engineering and manufacturing development in with project Milestone C in FY08.

### **Spider (Antipersonnel Land Mine Alternative (APL-A))**



**Description.** The Spider APL-A is a compact, lightweight, hand-emplaced, AP munitions system designed to replace the M16 and M14 AP mines for Army and Marine use. The Spider is comprised of three main assemblies: a remote control system, a repeater and up to 84 munition control units (MCU). Each MCU holds up to six miniature grenade launchers and is embedded with a GPS to provide accurate location to field components. The remote control unit (RCU) allows for man-in-the-loop, on-off-on and self-destruct capabilities via remote control. Additionally, Spider includes a munition adapter module that will initiate electric blasting caps and shock tubes to fire other lethal (Claymore, SLAM) and nonlethal munitions.

**Program Status.** Spider is currently in the SDD phase and projected to reach Milestone C in 1QFY06. LRIP will begin in FY06 and FRP in FY07. FUE is scheduled for FY07 and IOC in FY08.

### **Improved Ribbon Bridge (IRB)**

**Description.** The IRB, fielded to multi-role bridge companies (MRBC), provides a dependable roadway or raft capable of crossing assault vehicles or tactical vehicles over nonfordable wet gaps. The capability of this system is military load classification (MLC) 100 wheeled and MLC 80 tracked. The bridge sections are transported by Common Bridge Transporters (CBTs). The CBT is a heavy, expanded mobility tactical truck providing enhanced, multipurpose transportation capabilities. Each MRBC will have the capability of emplacing 210 meters of bridging. The system is external airlift transportable by CH-47 and CH-53 helicopters. The bridge bays are air transportable, partially disassembled, in C-130s. The IRB has enhanced capabilities of operation in swifter water speeds up to 10.3 feet per second and over 2.1 meter banks. It provides a 4.5 meter wide roadway, improved hydrostatic capabilities, and various other design improvements.



**Program Status.** A five-year, multi-year contract awarded in FY00 provides for 13 of 20 MRBCs with the IRB. Four units were fielded in FY03, with the remaining 9 units being fielded with the IRB in FY04-05.

### **Rapidly Emplaced Bridge System (REBS)**

**Description.** The REBS is a wheeled vehicle-launched bridge system providing a four-meter roadway width, MLC 30 Tracked (T) and Wheeled (W) normal and MLC 40(T)(W) gap crossing capability up to 13 meters. Transported on a CBT, each SBCT will have 4 REBS. This system is transportable by CH-47 and CH-53 helicopters and C-130 aircraft. Two Soldiers can deploy the REBS in the daytime within 10 minutes with little or no site preparation.

**Program Status.** A five-year, multi-year contract was awarded in FY01 for 18 systems with an option for 22 systems. FUE is scheduled for 3QFY05.

### **Dry Support Bridge (DSB)**

**Description.** The DSB is a modular bridge that can span a 40-meter gap and can be emplaced in 90 minutes by eight Soldiers. It significantly reduces the manpower and time needed to construct a tactical bridge as compared to current systems and possesses greater load capability. One bridge set provides either a 40-meter bridge or two 20-meter bridges. The bridge will cross MLC 96W/70T traffic and will allow the crossing of a heavy-equipment transporter carrying a combat-loaded M1 tank. The DSB consists of a launcher permanently mounted on a PLS, three CBTs and three PLS trailers that carry the modular components as palletized loads. A bridge set consists of six M1077

flat-rack loads of bridge components, one M1077 flat-rack load of launch beams and a launcher vehicle.

**Program Status.** A multi-year contract awarded in FY00 provides the DSB to 15 of 20 MRBCs. Fielding initiated in FY03 will continue at approximately two MRBCs per year for systems funded.

### **Sustainment Capabilities**

Army forces must be sustainable across the spectrum of conflict. Sustainability requirements reflect the continuous, uninterrupted provision of combat service support to Army forces. A full-spectrum Army will require a combat service support reach capability that allows commanders to reduce stockpiles in theater while relying on technology to provide sustained velocity management and real-time tracking of supplies and equipment.

Leveraging information technology and innovative concepts to develop an interoperable, joint command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) architecture is also critical to the development of a joint operational picture that includes logistics information. Future Force units will “see first” by identifying current status of equipment readiness and sustainment requirements and the flow of logistics to enhance combat power.

The Current Force has employed advanced technologies coupled with a ubiquitous array of networked ground, air and space sensors to provide the commander an unprecedented logistics operating picture. Sensors (RF tags and interrogators) coupled with the Movement Tracking System (MTS) have enabled a clear picture of the movement of supplies to the warfighter.

Future data fusion and systems, like the joint Global Information Grid (GIG), coupled with innovative leader training, will enable logistic decision makers to view a synthesized COP of sustainment requirements. This COP will provide near real-time status and locations of inventories to effect combat power. This will enable the commander to develop and evaluate effective offensive and defensive courses of action in line with logistical parameters.

The COP produced by seeing first will allow leaders of the Joint Force to understand current logistic postures and supplies and the ability to respond to known requirements. Leaders at all levels—strategic, operational and tactical—will observe the COP and simultaneously analyze and share assessments through a collaborative planning process enabled by information technologies.

Future Force commanders will be able to leverage this information to enhance collaborative planning, reduce the decision cycle and seize the initiative, build combat power prior to, during and after operations.

The BCS3 embedded within the ABCS, and the C4 and ISR enhancements will improve the connectivity and network between tactical, operational and strategic units and provide a logistical COP to all commanders. ABCS is interoperable with both joint and multinational systems and leverages theater assets, like the Joint Surveillance Target Attack Radar System (JSTARS).

### **Discussion of Key Sustainment Materiel Programs**

#### **Transportation Coordinators' Automated Information for Movement System II (TC-AIMS II)**

**Description.** TC-AIMS II is a Logistics Transformation enabler that establishes the base-

line for the deployment infrastructure needed to meet Future Force deployment objectives. The Army is the lead for the development of this joint system, which addresses critical shortfalls in the movement of materiel and personnel in support of DOD operations and the joint deployment process. CJCSI 3020.01 directed the Services to field TC-AIMS II to their early-deploying units by the end of FY03. TC-AIMS II merges the best business practices of the current Service-unique transportation automated information systems into a single system that combines the requirements for unit movement, Installation Transportation Office/Transportation Management Office, and theater distribution functional areas as well as integrating several legacy systems of each of the four Services. TC-AIMS II improves joint capabilities for rapid worldwide deployment and redeployment, and enables individual units the autonomous capability to conduct rapid crisis response at BCT level. Each battalion and separate company will be trained on TC-AIMS II and provided with a complete suite of computer hardware.

**Program Status.** The TC-AIMS II program has been segmented into five blocks of requirements that support a spiral software development strategy. TC-AIMS II Block I was fielded to USAREUR, fielding continues to the Army and the USN to achieve a FOC in all Services by FY09.

#### **Movement Tracking System (MTS)**

**Description.** MTS is a critical logistics transformation enabler. It provides continuous CS/CSS asset visibility and situational awareness for the joint logistics corporate enterprise, enables expeditionary logistics, and is a key step in achieving the sense-and-respond capabilities required to support network-centric warfare operations. MTS assists CS/CSS unit commanders in planning and executing



operations with the capability to identify and track positions, monitor progress, and communicate with tactical wheeled vehicles supporting CS/CSS operations within the tactical area. MTS supports BFT by passing position location information into the logistics COP via BCS3. MTS is a satellite-based tracking/communications system consisting of mobile units, transceivers, control stations, a GPS, common operating software and MTS-unique software.

**Program Status.** MTS has been fielded with a priority given to units supporting OIF and units undergoing reset following rotation from OIF. These have included 3rd Infantry Division (ID), 4th ID, 42nd ID and SBCTs. The system will continue fielding with phased upgrades to include embedded GPS, integrated radio frequency identification (RFID), and anti-spoofing technology. Current funding levels will permit fielding of 48 percent of the Army Acquisition Objective (37,718) to AC and RC through FY11.

**Battle Command Sustainment Support System (BCS3) [previously the Combat Service Support Control System (CSSCS)]**

**Description.** The BCS3 is a decision-support system embedded within the overall ABCS that assists commanders and their staffs in planning and executing CSS operations and is

key to building and sustaining combat power in a continuous operational environment over extended distances. BCS3 will rapidly collect, store, analyze and disseminate critical logistics, medical and personnel information. BCS3 is the CSS component of the ABCS, as well as a key logistics enabler in the Army's transformation efforts and will be interoperable with GCSS Army. BCS3 is comprised of computer units, common operating software and unique software. BCS3 is deployable in a tabletop configuration, with or without storage/transit cases, and in Standardized Integrated Command Post Systems (SICPS) configurations.



**Program Status.** BCS3 is being fielded under an urgent needs requirement to Army and USMC units supporting OIF and OEF. It will be fielded to U.S. Forces Korea early in CY05 as it continues development to reach full IOC in FY06.

**Global Combat Support System (GCSS) Army**

**Description.** GCSS Army is the Army's primary enabler for CSS transformation. It supports the functions of manning, arming,

fixing, fueling, moving and sustaining Soldiers and their systems. GCSS Army will be integrated with the Logistics Modernization Program (LMP) by use of the web-enabling features of Product Life-cycle Management Plus (PLM +) product to comprise the Single Army Logistics Enterprise (SALE). The result will be a seamless enterprise-wide logistics environment that spans from the factory to the foxhole, fully integrated with emerging joint battle command architectures. Both LMP and GCSS Army feature centralized total asset visibility, distribution-based supply, and enterprise-wide maintenance data, and near real-time logistics readiness information. Improved software will achieve CSS integration that is currently lacking in the Army's present business systems/processes. Most importantly, the modernization is targeted to improve business operations up and down the supply chain while providing the capabilities to meet Future Force CSS objectives.

**Program Status.** The Army selected SAP America, Inc.'s Enterprise Resource Planning software in FY04 to fulfill the requirements of GCSS Army. The Program is currently mapping GCSS Army requirements to SAP software modules to support design of the enterprise solution. Mapping is scheduled to be complete in FY05 with fielding to begin in FY07.

#### **Combat Service Support Automated Information System Interface (CAISI)**

**Description.** CAISI allows legacy and emerging battlefield CSS automation devices to electronically exchange information with logistics support areas and via tactical networks with other battlefield, CSS and sustaining base automated systems; provides commanders and managers an interface device to support current and future CSS doctrine during peacetime and wartime—concentrat-

ing users and transferring accurate, timely information on a highly mobile battlefield.

**Program Status.** CAISI is currently being fielded to Active and Reserve units in line with the Army transition to a modular force and the overall implementing directions in the Army Campaign Plan. CAISI continues to field units deploying in support of OIF.

#### **Combat Service Support (CSS) Satellite Communications (SATCOM)**

**Description.** CSS-SATCOM provides rapidly employed, BLOS communications enabling hardware to logisticians at the tactical and operational levels. The program, which grew out of the G-4 Connect the Logistician Focus Area, provides COTS-based very small aperture terminals (VSAT) and a supporting, global infrastructure to logistics activities integrated within and supporting the Army's modular force structure.

**Program Status.** CSS-SATCOM has completed fielding to the 3rd Infantry Division. The system is currently being fielded to the 101st and 10th Divisions and is aligned with the Army Campaign Plan for future fieldings. CSS-SATCOM was designated a formal program in the 1QFY05 under the auspices of PEO EIS. Formal program management constructs will be developed in FY05.

#### **Advanced Aviation Forward Area Refueling System (AAFARS)**

**Description.** AAFARS M100A1 is a modular, four-point refueling system. The principal components are engine, pump, filter and control modules, along with hoses, nozzles, couplings, defueling pump, fuel blivets (500-gallon drums), fire-suppression equipment, fuel spill containment berms, nozzles and fuel test kit. The AAFARS is transported

inter-theater in three specialized shipping containers.

**Program Status.** Fielding began in Oct 04.

### **Tactical Electric Power (TEP)**

**Description.** TEPs are all-mobile, engine-driven, electric power generating sources, 750 kW and smaller, which are skid-mounted, wheel-mounted or man-portable. TEPs are capable of independently producing electric power when operating on diesel, gasoline or other fuel sources. Included are follow-on power sources such as fuel cells and thermoelectric devices. These mobile, tactical generators provide quality power to operate DOD systems away from a fixed power grid and are found in nearly every organization in the Army. They directly support all field electrical systems such as C4ISR, medical, maintenance, fire direction and controls, target acquisition, life support, sustainment and illumination. These functions are critical to mission accomplishment across the entire spectrum of military operations.

**Program Status.** TEP Tactical Quiet Generators (TQGs) are currently in production and being fielding. The next generation of TEP generators, the Advanced Medium Mobile Power Sources (AMMPS), reached Milestone B in Nov 03 and begins production in FY08. To date, half of the older MILSTD generators have been replaced by TQGs and over 30,000 remain to be replaced by TQGs and/or AMMPS.

### **Standard Automotive Tool Set (SATS)**

**Description.** Modular, flexible and standardized, SATS replaces multiple field-level shop sets with a single, consolidated base tool set augmented with packages that are tailorable to unit mission requirements and

organizational design. SATS consists of a set of professional-grade tools with lifetime warranties, physical security, protection from the elements, and rapid tool identification for improved accountability and inventory as well as deployability. The design and storage method of SATS facilitate rapid inventory and enable the operator to verify within two hours or less that all items are present and secured in their designated storage locations. The most significant advantage gained through use of SATS is its impact on the logistics footprint; through standardization and modernization, SATS reduces the tool load weight by 18,000 pounds in the forward maintenance company (FMC) of the SBCT, eliminating the need for four tactical wheeled vehicles and trailers. The same tool weight savings is realized in both the forward support company (FSC) and brigade support company (BSC) in the FXXI Division design along with a reduction of five tactical wheeled vehicles and trailers in each company.

**Program Status.** SATS begins LRIP in FY05 and full production in FY06 with FUE scheduled in FY05.

### **Family of Medium Tactical Vehicles (FMTV)**



**Description.** The FMTV is built around a common chassis and drive train, featuring over 80 percent commonality of parts and components between models and weight classes. Operating worldwide in all weather

and terrain conditions, the FMTV provides unit mobility, resupply and transportation at all organizational levels. It serves as the weapon systems platform for HIMARS and the support vehicle for Patriot. FMTV enhances crew survivability through the use of hardened cabs, three-point seat belts, central tire inflation, and machine gun ring-mount capability. It provides enhanced tactical mobility and is strategically deployable in C-5, C-17, C-130 and C-141 aircraft. FMTV reduces the Army's logistics footprint by providing commonality of parts and components, reducing maintenance downtime, and lowering operation and support costs that older trucks require.

**Program Status.** FMTV is in full production with over 18,500 trucks and 1,450 trailers fielded as of Oct 03. A competitive multi-year contract was awarded in Apr 03 to the current producer, Stewart and Stevenson, adding new models that include an expansible van, 10-ton dump, and 8.8-ton Load Handling System (LHS) truck and companion trailer compatible with flat racks, container roll-in/roll-out platform (CROPs), and International Standardization Organization (ISO) shelters/containers. The HIMARS launcher chassis production build began in Oct 03.

#### **High Mobility Multipurpose Wheeled Vehicle (HMMWV)**

**Description.** The HMMWV is a light, highly mobile, diesel-powered, four-wheel-drive vehicle that uses a common chassis. Using common components and kits, it can be configured as a troop carrier, armament carrier, shelter carrier, ambulance and TOW missile carrier. It is a tri-Service program that also provides vehicles that satisfy USMC, USN, USAF and foreign military sales (FMS) requirements. The Up-Armored HMMWV is a key asset in the ongoing security and stabilization operations in OEF and OIF with its



increased ballistic (up to 7.62 mm NATO AP) and blast protection (12-pound mine, front; 4-pound mine, rear).

**Program Status.** In full production since FY85, current full production includes the HMMWV A2 (USMC and FMS only) expanded-capacity variants (M1151/M1152) and the up-armored variants (M1114). HMMWVs are being fielded to MP units (M1114), data interchange customers (M1151/M1152), SBCTs and other select units.

#### **Heavy Expanded Mobility Tactical Truck (HEMTT)**



**Description.** The HEMTT family of vehicles provides all-weather, rapidly deployable transport capabilities for resupply of combat vehicles and weapon systems. There are six basic configurations of the HEMTT series trucks: M977 cargo truck with Material Handling Crane (MHC), M978 2,500-gallon fuel tanker, M984 wrecker, M983 tractor, the M1120 HEMTT-LHSs and M985 cargo truck with MHC. A self-recovery winch is also avail-

able on certain models. HEMTT-LHS provides the Soldier with an efficient and economic system with capabilities that cannot be replicated in the light and medium truck fleets. The HEMTT family of vehicles is designated as an FCS-complementary system and is a key enabler to achieving a distribution-based logistics system.

**Program Status.** All variants of the HEMTT are currently in production. The FY06-11 fielding schedule includes SBCTs 4-6, ADRS units, and air defense units (Patriot and THADD).

### **Palletized Load System (PLS)**



**Description.** The PLS is composed of a prime mover truck with integral self-loading and unloading transport capability, a 16.5-ton payload trailer, and demountable cargo beds (flat racks). The vehicle can also be equipped with materiel-handling equipment and/or a winch. PLS is a key transportation component of the ammunition distribution system and provides long-range hauling, local hauling and unit resupply of ammunition. The PLS is capable of transporting multiple configurations of cargo utilizing a variety of flat racks. The M1077 and M1077A1 are sideless flat racks used to transport pallets of ammunition and other classes of supplies. The M1 flat rack carries identical classes of supplies. It is ISO/CSC certified and is suitable for intermodal transport, including transport on container ships. Ammunition can be

loaded on the M1 at depots, transported via container ship to theater, picked up by the PLS truck and carried forward without the use of any materiel handling equipment. The PLS provides the Soldier with an efficient and economical system with capabilities similar to that of HEMTT-LHS, and is a major enabler in the Army's drive to achieve a distribution-based logistics system.

**Program Status.** The PLS is currently in production. The FY06-11 fielding schedule includes AC and RC engineer mission modules, APS and OIF combat loss replacements.

### **Containerized Kitchen (CK)**

**Description.** The Containerized Kitchen (CK) integrates standard and commercial kitchen equipment into an expandable 8'x8'x20' ISO container. The CK has onboard refrigeration and uses the improved modern burner unit. The CK has a running water system and the interior is environmentally controlled. The CK can feed three meals a day to 800 Soldiers. Its efficiencies over the Mobile Kitchen Trailers (MKTs) include overall decreased footprint and manpower requirements.

**Program Status.** The CK has been in continuous production since FY02. Over 200 systems have been produced and fielded and a new contract award is scheduled for the 2QFY05.

### **Unit Water Pod System (Camel)**

**Description.** The Camel system contains a 900-gallon storage capacity, heater/chiller unit, government-furnished M1095 (5-ton) medium tactical vehicle (MTV) trailer, and contractor-developed components mounted on or carried by the trailer. It will provide a maneuver company operating in a temperate environment 2+ days of supply of water at a

minimum sustaining consumption rate. It will have provisions for at least six retail dispensing points, and be fully capable of stand-alone operation. Camel will be capable of transporting both full and partial loads of water in accordance with approved OMS/MP standards by C-130 and larger aircraft, external lift helicopter, and low-velocity air droppable means. Camel replaces the M107, M149, and M1112 series water trailers.

**Program Status.** The Camel ORD was approved in Mar 02. The Camel contract was awarded in Aug 03. The design and build of four prototypes for production qualification testing (PQT) is projected for Dec 04 through Apr 05.

#### **Load Handling System (LHS) Compatible Water Tank Rack System (Hippo)**

**Description.** The Hippo consists of a 2,000-gallon, ISO-framed, potable water tank rack. The Hippo has an organic 125-GPM water pump, filling stand, 70-foot hose reel for both bulk suction and discharge and retail distribution. The Hippo will enhance water distribution by providing one system that enables both hardwall bulk water transportation and unit retail water support. It will allow for water transport directly from water purification points to supported maneuver elements and can be used as a water distribution point.

**Program Status.** All testing is complete. Milestone C FRP decision is expected in Jan 05. Fielding of the Hippo will begin following Milestone C decision.

#### **Load Handling System Modular Fuel Farm (LMFF)**

**Description.** The LMFF provides the ability to rapidly establish a fuel distribution and storage capability at any location regardless of the

availability of construction equipment or materiel handling equipment. The LMFF consists of 2,500-gallon, ISO-framed fuel tank racks and 400-GPM, ISO-framed pumping modules. The pumping module will have a pump, engine, fuel/water separator, control panel, hoses, nozzles and other support equipment. The 35,000-gallon-capacity LMFF consists of 14 tank racks and two pumping modules. The 45,000-gallon-capacity LMFF consists of 18 tank racks and two pumping modules. The LMFF is compatible with the PLS and the HEMTT-LHS, allowing these systems to recover the tank racks and pumping modules, transport them to the new location, and emplace the system.

**Program Status.** ORD approved at the Department of the Army. Production verification test occurred in 4QFY04 and FUE in FY06. SBCTs will be the first units to be fielded the LMFF. Milestone C decision package is being prepared for approval, which will include the deletion of an 18-rack system and the creation of a line item number for a single storage tank rack.

#### **1,500-GPH Tactical Water Purification System (TWPS)**

**Description.** The TWPS is a mobile water purification system capable of purifying, storing and dispensing water, meeting tri-Service field water quality standards for long-term consumption. Once emplaced, the system is intended to supply potable water, from a broad range of source waters, to ground, amphibious and air-mobile units of the U.S. Army and Marine Corps. It can also be used to provide potable water support to civilian agencies or host nations for emergencies, disaster relief, humanitarian efforts and peacekeeping missions. TWPS can purify up to 1,500 gallons of water per hour from any water source, including 60,000 total dissolved solids, salt water

and NBC contaminated sources. TWPS provides water support for division and brigade ground units operating in remote areas. It will be mounted on an LHS- or PLS-compatible flat rack and can be transported on a C-130 fixed-wing aircraft. Fielding may be delayed for units without LHS or PLS, pending availability of required LHS or PLS systems from production.

**Program Status.** Scheduled for 3QFY05 fielding.

### **Rapidly Installed Fluid Transfer System (RIFTS)**

**Description.** RIFTS is a petroleum distribution system capable of rapidly deploying to distribute 875,000 gallons of fuel in a 24-hour day. Rapidly installed hose lines provides the ability to rapidly transfer fluid while decreasing traffic on main supply routes. RIFTS provides fuel distribution that is 10 times faster than the current Inland Petroleum Distribution System (IPDS). Procurement of RIFTS is conducted in two blocks. Block I includes development of the conduit (hoses), Employment Retrieval System (ERD) and auxiliary equipment. Block II includes the Automated Pump Stations (APS), Command and Control Module (C2M) with leak detection, computer-based planning aid and all auxiliary equipment.

**Program Status.** Block I production qualification testing/reliability is scheduled from Jun to Oct 05. Block I Milestone C is scheduled for Jan 06 and the FRP contract award is scheduled for Mar 06. Block II Milestone B and contract award dates are projected for 1QFY06.

### **Container/Material Handling Equipment (C/MHE)**

**Description.** C/MHE includes all container and material handling equipment required to support the deployment of unit equipment and the distribution of sustainment items. The primary tactical C/MHE includes the Rough Terrain Container Handler (RTCH), the All Terrain Lifter Army System (ATLAS), and the 4K Rough Terrain Forklift (4K RTFL). The RTCH is the primary capability for handling 20- and 40-foot long containers weighing up to 53,000 pounds. The RTCH is deployable by air, operates on all types of terrain, and is capable of stacking containers up to three high. The ATLAS has a 10,000-pound capacity and is capable of handling fully loaded 463L Air Force pallets, has a variable reach boom for removing items from 20-foot containers, and is capable of deploying by air. The 4K RTFL is capable of entering containers to remove items. The 4K RTFL fleet is reaching the end of its economical useful life and requires replacement. The Army Node Transloader (ANT) is being investigated as a possible replacement for the 4K RTFL. The ANT concept is based on the commercial materiel handling forklifts that are transported on the distribution platform, eliminating the need for secondary transportation for the forklift. This approach provides a distribution capability that has never existed, creating new options for the distribution of sustainment items.

**Program Status.** The RTCH program was terminated in FY04 with 342 of 463 AAO total systems fielded. The ATLAS initial production contract ends in FY05. A Milestone C is scheduled in FY05 for ATLAS with a follow-on production contract for an upgraded model beginning in FY07. The ANT will complete a user demonstration in FY05. A requirements document to support procurement of the ANT

will be generated using the results of the user demonstration in FY05.

### **Maintenance Support Device (MSD)**

**Description.** Formerly the Soldier Portable On-System Repair Tool (SPORT), the MSD is a lightweight, rugged, portable tester employed at all levels of maintenance. It is the Army's standard system tester used to automatically diagnose weapon system operations, both electronic and automotive, and identify faulty components for immediate replacement. The MSD and its predecessor, the SPORT, are in wide use throughout the Army's ground combat and CSS vehicle fleets as well as in the Army aviation fleet.

**Program Status.** The MSD is currently in FRP and fielding. A recent change in the basis of issue will provide the MSD to organizational level maintainers at a ratio of 1:3 per maintainer occupational skill.

### **Medical Communications for Combat Casualty Care (MC4) System**

**Description.** The MC4 system is a theater, automated combat health support (CHS) system that links commanders, health care providers and medical support providers at all echelons with seamless, integrated medical information. It will receive, store, process, transmit and report medical C2, medical surveillance, casualty movement/tracking, medical treatment, medical situational awareness, and medical logistics data across all levels of care. The MC4 system is fully operational with standard Army systems and operates on standard commercial hardware. The MC4 system is fully joint operations compatible and operates from a family of joint software. The MC4 system supports the commander with a streamlined personnel deployment system using digital medical information.

**Program Status.** MC4 has an approved ORD. The program is currently scheduled for a Milestone C decision in 1QFY04 and a FRP decision in 3QFY04.

### **Man-Transportable Robotic System (MTRS)**

**Description.** The MTRS provides a two-person, portable, lightweight robotic system capable of being helicopter transported, to give EOD Soldiers remote reconnaissance capability in situations where current robotics are too large to employ. Current operations have shown a need for smaller, portable, robotic systems. Lack of this capability requires EOD Soldiers to physically approach explosive devices and manually perform reconnaissance and render safe procedures in confined spaces. Requirements for additional MTRS were initiated and validated in response to the increased threat and sophistication of potential threats.

**Program Status.** The new MTRS AAO of 461 incorporates additional requirements resulting from lessons learned in OIF and OEF. These requirements are included in the program plan from through FY10.

### **Forward Repair System (FRS)**



**Description.** The FRS is a high-mobility forward maintenance system that reduces repair

cycle time. In one package, the FRS places proven tools, test equipment and heavy lift capability to support forces in forward battle areas. The FRS includes the prime mover, as well as a maintenance enclosure with a 35 kW generator, crane, welding equipment, industrial-quality power air and hand tools, air compressor and tool cabinets, and accepts FBCB2 and MTS connectivity. The FRS meets a maneuver commander's need for a repair system that is responsive and effective, and reduces the number of systems requiring evacuation.

**Program Status.** The FRS is in production and fielding. The first units fielded are III Corps, BCTs undergoing modular conversion, and SBCTs.

### Focused Logistics (FL) Summary

Sustainment of forces, in any environment, is critical to successful mission accomplishment. This appendix focused on the lift equipment modernization programs for assured mobility and sustainment systems. More important than materiel programs, however, is the entire redesign of the Army's force to a Future Force design and the accompanying logistics transformation effort addressed in the main body of this *2005 Army Modernization Plan*. This new design will greatly enhance the Army's ability to rapidly deploy and successfully carry out missions across the full spectrum of operations.

As the Army continues to transform itself into a Future Force design, the specific requirements needed to enhance mobility and sustainability will become clearer. The current plan funds those programs with proven potential for the Future Force while enhancing the capabilities and readiness of the Current Force.

## Appendix 4: Battlespace Awareness (BA)

Battlespace awareness (BA) is the ability to sense and understand the operational environment with its mix of friendly "blue" forces, enemy "red" forces and nonaligned actors/noncombatants, as well as terrain and weather aspects that can aid or hinder friendly force operations. BA relies on the continuous collection, processing, fusion, analysis and modeling of data from a large mix of highly responsive sensors (e.g., unattended, human, intrusive and remote) to provide the commander and his force elements with near real-time, collaborated, tailored, actionable battlespace information. Enhancing BA capabilities provides the commander with more confidence in his understanding of the operational environment and the associated operational risks. This translates to better and faster decision making in the planning and execution of operations. BA is the key to increasing the reach, persistence and agility of our military capabilities while increasing the range of military options available.

Observation and information collection occurs throughout the battlespace from traditional ISR sensors and collectors, such as satellite constellations, airborne and proximate sensors, human intelligence (HUMINT), sensors specifically designed to support weapons systems (e.g., Firefinder), to nontraditional sources, such as commercial and open sources. Each of these entities represents a node in the BA grid. Nodes provide data and information to the grid and draw information as required from the grid. Nodes range from every Soldier in the field as a potential sensor to the future space-based radar, as a primary provider of an extremely fine-grained depiction of the battlespace. Through these nodes, intelligence on current and future

activities in the operational environment and updated baseline environmental information is collected, fused, analyzed and presented to create a comprehensive battlespace picture. Baseline environmental data includes information on the weather, cloud cover, vertical temperature profile, humidity, wind, precipitation, soil moisture, ice cover, sea ice, electron density profile, vegetation, terrain, infrastructure, resources (e.g., water, energy sources, building materials), transient infrared sources, second-order effects like trafficability and sensor field of view; and significant social aspects such as the cultural, religious, economic, political and security situation. By utilizing the collection capability of all possible nodes, the reach, robustness and persistence of the entire sensing network are greatly enhanced to create a pervasive, detailed understanding of the battlespace.

One significant area of joint development that supports enhanced BA capabilities is space. Space is the backbone for the national and military ISR architecture and the domain of choice for commercial broad-area sensing enterprises with military utility. Space-based communications provide reach and NLOS connectivity while space-based ISR and commercial imagery platforms substantially enhance strategic, operational and tactical intelligence collection, processing and dissemination. Soldiers in OEF and OIF use space-based systems to communicate, navigate, target, find and fix the enemy, anticipate weather, receive missile warning, avoid fratricide and much more.

The Tactical Exploitation System (TES) embedded in the corps and division force structures is providing vital space-based imagery, signals intelligence (SIGINT), BFT and communications reach for OIF. The Army is currently developing the Distributed Common Ground System-Army (DCGS-A), as part of

the DOD DCGS family of systems concept, to incorporate ISR data and information from all sensors and analytic centers, regardless of the source. It will provide the red and gray weather and environment portions of the COP to commanders and decision makers down to the individual Soldier.

The shared visibility between operations and intelligence provides the venue to predict the effects of threat actions and changes in the operational environment as well as assess potential courses of actions against the threat operations. Decision making and forecasting tools will continuously evaluate changes in environmental data to identify potential impacts on ongoing operations and alert the relevant decision authority to the perturbation. Predictive analysis and modeling will allow potential courses of action to be evaluated with a better understanding of the potential impacts on the operational environment. The simultaneous current and forecasted depictions of the battlespace, coupled with the responsiveness of sensors, will allow commanders to quickly evaluate sensor mission utility and retask multiple sensors to react to emerging operational situations.

Current and projected operational information will be continuously fused by robust knowledge management systems and disseminated to all levels of users through adaptable, flexible, networked communications systems. Within this “producer interactive network,” force elements will subscribe to products or data (including archival data). Software agents will broker data and products, posting some unprocessed information. In this manner, all joint, allied and coalition warfighters will have access to common data, within security access and transportation layer constraints, to construct their own tailorable, relevant operational pictures. Access to the combat support

agencies' data is key to achieving dominant battlespace awareness.

Below is a brief discussion of some of the key materiel programs supporting BA capabilities.

## **Discussion of Key Battlespace Awareness Materiel Programs**

### **Distributed Common Ground System-Army (DCGS-A)**

**Description.** DCGS-A is a family of systems and an integral component of the Army's ISR networking strategy. DCGS-A will migrate capabilities of disparate ISR systems into a joint, common, interoperable multi-intelligence architecture to improve the ground commander's ability to act faster than the enemy's decision cycle, or ability to react. DCGS-A software/hardware used throughout the Army and joint environments will task, post, process and use Army, joint, national, interagency and multinational ISR sensor data and information in support of Future Force, joint task force and multinational operations. DCGS-A is an FCS complementary system, providing the threat, weather and terrain data to the UA through its embedded software capabilities. Fixed and mobile DCGS-A transparently operates with embedded DCGS-A software applications within the FCS, operating in a secure collaborative, networked environment. DCGS-A provides real-time, sensor-to-commander, sensor-to-shooter, and sensor-to-analyst information tailored to mission, task and purpose of the recipient.

**Program Status.** The DCGS-A program will employ an evolutionary acquisition strategy, providing incremental milestone decisions throughout the SDD phase based on validated/approved requirements for DCGS-A capabilities and the DCGS-A capability needs

inherent in other Future Force programs such as the Aerial Common Sensor and the FCS. Milestone B decision is scheduled for 2QFY06 to field an objective capability by 2010. The 525th MI Brigade, XVIII Airborne Corps, demonstrated a DCGS-A capability in FY04.

### **All Source Analysis System (ASAS)**

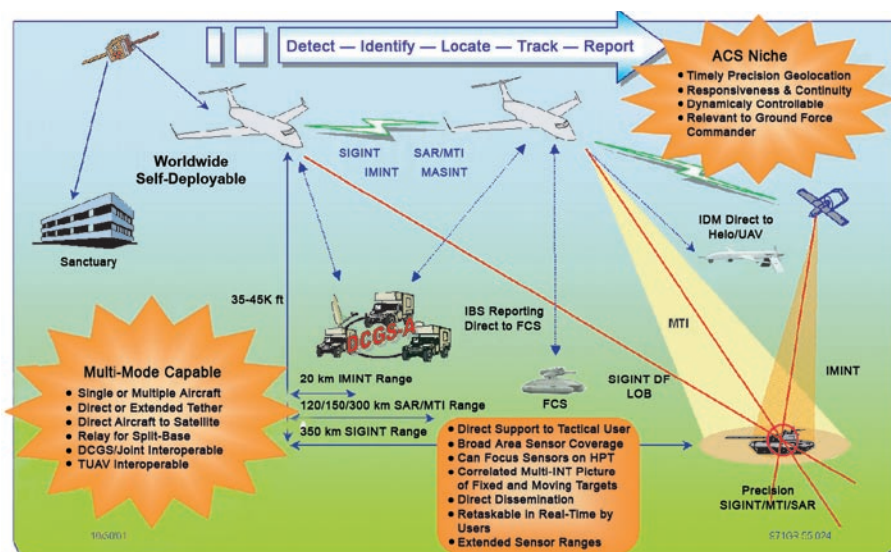


**Description.** ASAS provides accurate, clear, relevant, timely, and predictive automated actionable intelligence about the current enemy situation. The ASAS sets the environment that the commander and his staff need to plan and execute battles, engagements, and other missions across the full spectrum of operations in both a structured and nonstructured threat environment. ASAS assists the commander in visualizing the battlespace, organizing his forces and controlling operations to achieve the desired tactical objectives or end state. Inherent within ASAS is the capability to plan and direct intelligence, surveillance and reconnaissance operations, produce relevant information and intelligence, and disseminate intelligence and other critical information in an understandable format to those who need it, when they need it.

**Program Status.** ASAS Block II is in SDD with several components in FRP. The most significant of these is the ASAS Light, the intelligence staff support tool currently being fielded to the force. The ASAS Block II

Analysis and Control Element (ACE) Light is a software component of interim DCGS-A at 525 MI Corps and may become part of DCGS-A software.

### **Aerial Common Sensor (ACS)**



**Description.** ACS is the Army-led, joint airborne ISR system that meets the Army and Navy's requirements for a worldwide, self-deployable asset that can begin operations immediately upon arrival into theater, in front of, or alongside the Future Force. ACS will support the theater down to the UA commander and will merge the capabilities of Guardrail Common Sensor and Airborne Reconnaissance-Low into a single multifunction platform to provide the requisite networked situational awareness and joint network-centric and deep-strike precision targeting for the future joint force commander. ACS provides distributed, wide-area, persistent surveillance throughout the breadth of the joint operations area battlespace and multi-intelligence precision targeting. Using the DCGS for the ground station component, ACS, via robust sensor-to-shooter and reach links will provide commanders at every echelon with the tailored, multisensor intelligence required for

dominant maneuver, precision engagement, information superiority and decision dominance throughout a nonlinear framework and noncontiguous battlespace. Onboard battle command and communications relay packages will ensure uninterrupted, joint integrated C4I. Through a modular, open architecture,

onboard communication intelligence (COMINT), electronic intelligence (ELINT), imagery intelligence (IMINT) and measurement and signature intelligence (MASINT) sensors incorporating electro-optic (EO), infrared (IR), synthetic aperture radar (SAR), moving target indicator (MTI), multi- and hyperspectral imagery sensors, as well as onboard operators, will ensure sensor/processing technology enhancements maintain

pace with evolving threats via software vice hardware solutions.

**Program Status.** ACS is in the SDD phase with Milestone C decision scheduled for 4QFY08. FUE will be an aerial exploitation battalion in FY10, with four additional systems fielded at a rate of one every two years.

## Advanced Field Artillery Tactical Data System (AFATDS)

**Description.** AFATDS is the primary fire support system at division and below that provides tactical fire solutions, including weapon-target pairing, mission planning and execution. AFATDS provides the fires COP at each echelon, as well as the technical fire control providing ballistic solutions for cannons and rockets. AFATDS is a true joint system, fully fielded by the USMC, on USN ships and interoperating with the USAF via

the Air Force's theater battle management system (TBMCS). As such, AFATDS provides the capability to identify, track and respond to targets across the entire battlespace, using all fire assets available.

AFATDS also operates at echelon above division levels, providing a strategic and operational picture of the battlefield to meet the commander's top seven priorities. AFATDS provides the friendly picture of the location and status of all friendly fire support (FS) assets; the enemy situation, including tracking all enemy target locations; and a running fire support logistics status (munitions, rounds, and petroleum, oil and lubricants). AFATDS provides graphic control measures, maintaining a complete database of FS geometries and FS coordinating measures (FSCMs), and performing appropriate levels of coordination as required. The AFATDS FS target database and weapon status-tracking feed the commander's situation report. AFATDS management of the FSCM and capability overlays ensure optimal weapon target pairing and strategic attack analysis.

**Program Status.** AFATDS is currently fielded to 12 USN ships, 100 percent of USMC FS units, over 95 percent of the AC Army FS units and 50 percent of the ARNG FS units. Version 6.3.2 software is currently in use and will be replaced by version 6.4 in 2005. Future improvements will focus on increased joint interoperability, and new weapons and munitions functionality.

#### **Long-Range Advanced Scout Surveillance System (LRAS3)**

**Description.** LRAS3 provides unmatched long-range target acquisition and far target location capabilities to armor and infantry scouts. It consists of Horizontal Technology Integration (HTI) second generation FLIR

(cooled infrared), long-range optics, laser range finder, GPS interferometer, day video camera, and a link to FBCB2 for automated handoff of target locations. As the premier ground scout sensor system, it enables the scouts and cavalry units to conduct RSTA missions while remaining outside of threat acquisition and engagement ranges during all-weather and dirty battlefield conditions (i.e., fog, dust, smoke and sand). LRAS3 is also being integrated with a laser designator module (LDM) as the Fire Support Sensor System (FS3) for the Stryker Fire Support Vehicles and the Knight Fire Support Vehicles.

**Program Status.** LRAS3 is in FRP, and LRAS3 procurement is funded for AC heavy and light divisions. LRAS3 is being fielded to HMMWV-mounted scouts and is being integrated into the Stryker Reconnaissance Vehicles.

#### **Tactical Exploitation System (TES)**

**Description.** TES is the Army's Tactical Exploitation of National Capabilities (TENCAP) system that receives, processes, exploits and disseminates intelligence data from direct downlinks and other ground stations. The TES family of systems is a key part of the emerging DCGS architecture with TES variants in Army, USN, USMC and limited USAF units. The TES program combines the intelligence functions of four previous stovepiped ISR collection systems into an integrated downsized, open, scalable, modular and network-centric architecture with all elements fully transportable by C-130 aircraft. TES tasks, receives, processes and exploits ELINT, COMINT externals, IMINT and MTI data from selected national, theater, and tactical platform/sensors and generates timely information, intelligence and targeting data. TES also is capable of limited MASINT processing and analysis. TES receives

space-based BFT data and provides it to the GCCS Army. TES has a direct digital/network interface with the AFATDS and Automated Deep Operations Coordination System (ADOCS). TES performs the preprocessor functions for the ASAS, Common Ground Station (CGS) and Digital Topographic Support System (DTSS). Designed for split-base operations, TES supports joint, combined and early-entry operations.

**Program Status.** TES-Main and TES-Forward systems have been fielded to 18th Airborne Corps, V Corps, III Corps and 513th MI Brigade. Division-TES (DTES—division level assets) will be fielded to all AC divisions by Jan 05. TES-Forward (minus) systems will be fielded to 501st MI Brigade and to I Corps in FY06. Plans to support the USFK Operational Needs Statement for a complete TES-Forward system for the 501st MI Brigade have been curtailed due to funding. Twenty-one TES-Light systems will be fielded to SOF, ACR, Republic of Korea Army and selected brigade-level elements starting in FY05. A number of TES systems were deployed in OEF and OIF and judged in after-action reports as being very supportive of high-OPTEMPO, ISR and dynamic targeting demands. TES systems were the primary interface for missile launch notifications within the corps and divisions. Although the draft DCGS-A roadmap contains TES-Forward configuration items, TES or an equivalent capability has yet to be integrated into the modernization plans of the objective ISR architecture. TES systems will be in the force structure until the objective DCGS-A system is fully fielded, sometime after 2015.

### **Integrated Meteorological System (IMETS)**

**Description.** IMETS supports the Current Force, including aviation, SOF and SBCTs. It will migrate through spiral development to

DCGS-A in the Future Force in 2008. IMETS ingests local aviation surface weather and artillery upper observations, weather satellite data, and observations from unattended, automated observing equipment. IMETS receives transmissions of centrally prepared USAF forecast products. IMETS uses Army weather effects software linked to current and forecast data to determine weather effects on friendly and enemy personnel, equipment and operations. IMETS provides tailored weather forecasts and space weather impacts for planners and operations, including chemical defense. Weather effects are linked to users within each supported tactical operations center (TOC) by direct machine-to-machine interface, enabling users to interact with the database to determine details on adverse weather effects. IMETS is the gateway and communications interface to support major subordinate commands and warfighters without direct weather support.

**Program Status.** IMETS is primarily an NDI, which will have three separate, distinct configurations: the vehicle-mounted; the command post (CP), and the light. The vehicle-mounted and light configurations are in FRP. The IMETS objective software applications underwent testing in 4QFY04 with fielding to be initiated in FY05. This is the hardware and software baseline that will support ABCS 6.4 and provide the bridge until DCGS-A and FCS integrate the capabilities.

### **Prophet**

**Description.** Prophet provides a near real-time view of the brigade/ACR/SBCT/UA area of operations through the use of COMINT sensors, and includes the capability



to detect, identify and electronically attack select enemy emitters. It is a dedicated, dynamically retaskable asset, allowing the tactical commander to visually depict and understand his battlespace, now and in the future. It provides expanded frequency and area coverage for situational development and awareness, as well as force protection operations. Prophet can operate on-the-move, mounted on a HMMWV, or stationary in a mounted or dismounted configuration. It has an open architecture that supports programmed improvements and mission-specific technical insertion components. This makes Prophet relevant throughout the entire spectrum of operations. Prophet has been an invaluable and critical collection asset in the global war on terrorism.

**Program Status.** Prophet Block I began fielding in Nov 02. In fact, Prophet Block I was fielded to all deploying forces in support of the global war on terrorism. Prophet Blocks II/III went into the SDD phase in Mar 03 with an FUE of 4QFY05.

### **Tactical Unmanned Aerial Vehicle (TUAV) Shadow 200**



**Description.** The RQ-7A Shadow 200 TUAV provides the maneuver commander with a near real-time, highly accurate, sustainable capability for over-the-horizon RSTA, and Battle Damage Assessment (BDA). Each Shadow 200 TUAV system consists of four Shadow 200 air vehicles, six HMMWVs, two Ground Control Stations (GCS), one portable GCS, and four remote video terminals that can provide near real-time video to commanders on the ground. The Shadow 200 TUAV currently has an onboard EO/IR sensor payload. Objective payloads may include but are not limited to advanced EO/IR, all-weather SAR and MTI, and SIGINT sensors. The threshold

		FY04	FY05	FY06	FY07	FY08	FY09	FY10
TUAV Fielding	Oct					116 HVY		50 IN 149 IN
	Nov			SBCT5		256 HVY	86 IN	2 IN
Previously Fielded	Dec							
	Jan					278 ACR (HVY) 56 IN	3 IN	53 IN 2 IN
Tng Base (4)	Feb					155 HVY		45 IN 92 IN
	Mar					1 HVY		
(2)	Apr					48 HVY		
	May				30 HVY	41 IN		FY11 32 29 1 3 26 IN IN IN IN IN 76 66 207 IN IN IN
	Jun	SBCT6 29 ID				218 HVY		
(1)	Jul	SBCT3 In NET	NG Trng System		81 HVY	37 IN		FY12
	Aug	(In NET)				55 HVY 2 IN		
(2)	Sep				39 IN	49 IN		

As of 15-Nov-04

Figure D-9. Critical Sensors Fielding Schedule

range is 50 km with an objective range of 200 km and an on-station endurance of four hours. The threshold payload is 60 pounds with an objective capacity of 100 pounds. OPTEMPO requires a threshold of 12 hours per 24-hour period and an objective of 18 hours per 24-hour period.

**Program Status.** TUAV IOT&E was completed in May 02 followed by a Milestone III FRP decision in Sep 02. FUE was 3/2 IN SBCT in May 02 and IOC was achieved in Oct 02. Production and fielding continues under the FY06-11 program plan. The TUAV is currently supporting the global war on terrorism. The TUAV program was revalidated by JROC in 2004.

### **Counterintelligence/Human Intelligence Information Management System (CHIMS)**

**Description.** CHIMS provides counterintelligence (CI) investigator/interrogator and HUMINT agent/Soldiers with automation support for the collection, analysis, production and dissemination of HUMINT and CI data/information. CHIMS provides the Army commanders at all echelons down to the BCT with automation for the collection management, analysis and production of CI and HUMINT data into actionable intelligence. It is designed to support the commander's ability to anticipate and react to a wide range of force protection threats and situations. The system is message and reporting interoperable with the Army ASAS at the tactical level with planned enhancements to be interoperable with the Portico program and the Defense Counterintelligence Information System (DCIIS) at the strategic level. The Biometric Automated Tool (BAT) system that has evolved out of OIF and OEF has been integrated into the CHIMS software to capture and store fingerprints, facial recognition and

iris scan algorithms for HUMINT data fusion and correlation of detainee, employee and refugee tracking during stability and support operations (SASO). CHIMS also provides the capability of document exploitation (DOCEX) for the screening/triage in over 40 languages with planned Arabic-to-English audio and visual look up enhancements.

**Program Status.** CHIMS is a spiral development effort with Version 4.2 currently in FRP with all procurement in direct support of OEF and OIF. The software in the SDD phase is planned for integration into the DCGS-A Spiral Four initiative and should start production in FY06.

### **Battlespace Awareness (BA) Summary**

BA supports and is supported by the other functional concepts. BA enables JC2, force application and force protection to bring combat power to bear at critical points, avoid enemy denial and deception, breakthrough or circumvent anti-access and area-denial strategies, and thwart enemy attempts to harm U.S. interests worldwide.

BA capabilities strive to achieve superior situational understanding of the threat and battlespace; decision superiority using precision actionable intelligence to achieve desired effects rather than physical destruction alone; integration of multifunctional tactical and national intelligence sensors and sources; precision targeting and armed aerial reconnaissance; and denial of enemy access to friendly information.

Recent operations have shown the value of space-based, airborne and ground C4 and ISR systems that are networked with manned ground systems to achieve Joint Force BA capabilities. The Army is developing organizations and fielding equipment to capitalize on

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this operational experience in today's Current Force as well as in the building of tomorrow's Future Force with future Joint Force BA capabilities.

## **Appendix 5: Command and Control (C2)**

C2 is the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. To accomplish this effectively, the commander fuses battlespace information with information on force locations and capabilities, as well as other information relevant to mission planning, into a COP. The commander develops alternative plans of action, selects a course of action and directs force employment exercising C2. This can be either a deliberate process in preparation for a campaign or battle, or a hasty process in response to battlefield opportunities or challenges. Key elements of C2 are a decentralized, networked and collaborative communications and computer environment that provides the precision guidance and timing capabilities that collectively support accelerated decision-making processes throughout the Joint Force. The synergy of this collaborative environment with the COP allows subordinate commanders to self-synchronize their activities, based on knowledge of the commander's intent and of the current situation in battlespace, and to execute actions seamlessly, with minimal or no requirements for deconfliction or coordination.

Army C2 is a critical enabler for and a fully interoperable component of JC2. Army C2 consists of Army battle command (cognitive and technical aspects) and the Army network component of the GIG. The joint concepts for JC2 and Army battle command concepts are complementary and commander-cen-

tric. Both are focused on achieving better situational understanding and decision dominance.

### **Battle Command**

The Army views battle command, the art and science of applying military leadership and decision making, as the essential capability that enables the conduct of current and future joint operations. Enabled by C4 and ISR, battle command enhances the commander's ability to gain information and decision-making advantages over any adversary. Further, C4 and ISR networks within the GIG will provide an inherently joint, top-down network that provides common situational awareness to improve battle command. Army battle command modernization efforts are designed to bridge the Current Force to the Future Force, enable network-centric warfare, and allow the operational and tactical commander to see first, understand first, act first, and finish decisively with unprecedented situational understanding and decision superiority.

One recent initiative to enhance Current Force capabilities is termed "good enough" battle command. This initiative reviewed current operational requirements in order to resource current combatant commander's needs with a baseline command post capability as a first step in bringing these capabilities to the Current Force. This capabilities-based baseline uses existing resources in the ABCS program to standardize software in 2004, ensure joint interoperability of essential capabilities, and distribute this capability across the Current Force by FY07. This initiative is part of an overall "Army Battle Command Way Ahead" strategy that develops a single standardized battle command system that incorporates operational lessons, the requirement for Joint Battle Management Command and Control (JBMC2), and emerging joint requirements.

## The Network

Concepts for network-centric warfare, full-spectrum dominance, and decision superiority are driving C2 modernization efforts for the Army's Future Force and the Joint Force. These concepts require a robust, modular, deployable, and always capable network that provides universal access to all relevant authorities, assets and capabilities. This network consists of integrated information systems, supporting information infrastructure and a knowledge-based force of individuals located across the entire spectrum of the battlefield from the Soldier on point, through a variety of operations and support centers in theater, to home station operations and support centers located worldwide. To achieve this level of networking, the focus is being shifted from a bottom-up to a top-down approach that develops integrated C2 network architectures designed to support battle command capabilities for the Current and Future Forces in the JIM, full-spectrum operational environment. The Army is currently identifying baseline network capabilities for the JIM environment and will use a single Army lead for network development to enhance the Current Force and accelerate network development for the Future Force.

Below is a discussion of key Army C2 materiel programs that support JC2 and development of a COP.

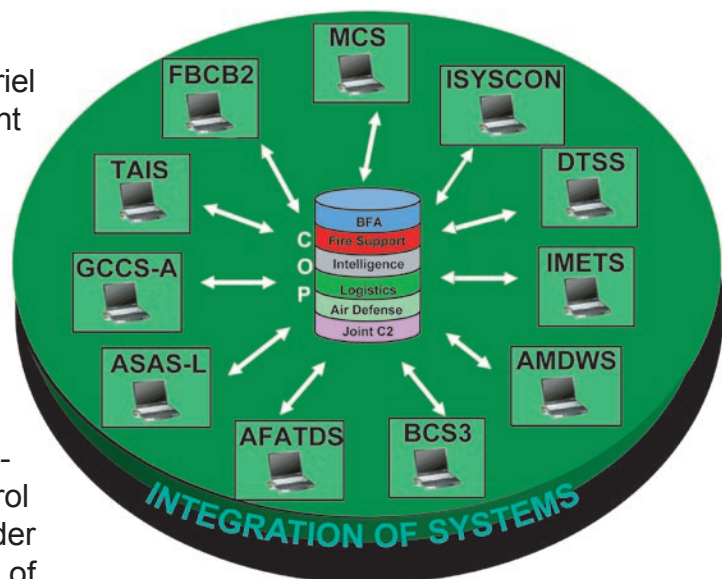
### Discussion of Key Command and Control Materiel Programs

#### Army Battle Command System (ABCS)

**Description.** ABCS is the Army's component of the Global Command and Control System (GCCS) and combatant commander deployment C2. It is a complex system of

systems that receives and transmits information among the Joint Force. ABCS consists of subsystem software that provides specific support for the Battlefield Functional Areas, including Global Command and Control System-Army (GCCS-A), Maneuver Control System (MCS), Air and Missile Defense Workstation (AMDWS), Force XXI Battle Command, Brigade and Below (FBCB2), All Source Analysis System-Light (ASAS-L), Advanced Field Artillery Tactical Data System (AFATDS), Integrated Meteorological System (IMETS), Digital Topographic Support System (DTSS), Battle Command Sustainment Support System (BCS3), Integrated Systems Control (ISYSCON) and Tactical Airspace Integrated System (TAIS). Additionally, common software products enable information sharing with other systems and provide situational awareness of the battlefield to every echelon.

**Program Status.** The Army has reassessed the ABCS software and will conduct an operational test and evaluation (OT&E) for ABCS 6.4 in 2QFY05. The new baseline software will be used on all ABCS systems. 6.4 will maintain a joint interoperability with other Services at the division level and



above, while still providing the COP at division and brigade levels within Services. The test will also assess the current distribution and sustainment strategy to see what initiatives can take place in order to further promote ABCS interoperability across the Army and within the Joint Force structure.

### **Global Command and Control System-Army (GCCS-A)**

**Description.** GCCS-A is a computer-based strategic C2 system that provides readiness reporting, mobilization and deployment of AC and RC forces. It also provides detailed information on intra-theater planning and movement, the joint interface between JC2 systems, and the Army ABCS components. GCCS-A provides joint COP information to Army users and provides Army forces information to the joint COP. GCCS-A is a seamless Army extension to the joint GCCS at echelons above corps through modular BCT levels. GCCS uses a common open systems hardware architecture that has a combination of government and COTS hardware and software. The GCCS-A is an integral component of the GCCS family of systems (FoS), a networked system of information systems to facilitate joint command and control.

**Program Status.** GCCS-A is a fielded system within the ABCS. GCCS-A upgrades are based on operational needs and technical interoperability requirements with joint GCCS, DII COE and ABCS. GCCS-A, along with the other GCCS FoS, is mandated to migrate to a net-centric C2 capability; the current program in development to accomplish this direction is the DOD JC2 capability initiative. The JC2 capability program is projected to begin fielding the new net-centric capabilities, integrated with the GIG Net-Centric Enterprise

Services (NCES), during Block 1 execution in FY06-07.

### **Mounted Battle Command on the Move (MBCOTM)**

**Description.** MBCOTM provides the maneuver commander and his staff with a highly mobile, self-contained and reliable combat vehicle-based digital command post. The MBCOTM mission equipment platform consists of a suite of communications and digital equipment/software integrated on a combat platform to enable commanders to influence the battle while maneuvering across the battlefield. The MBCOTM provides situational awareness and a COP, which allows the commander to maintain situational understanding while moving and physically separated from a fixed command post. Future plans include variants for the HMMWV, the Bradley Fighting Vehicle and the Stryker.

**Program Status.** Program is currently funded for RDTE in the FY06 budget.

### **Maneuver Control System (MCS)**



**Description.** MCS is an automated C2 system that provides a network of computer terminals to process combat information for battle staffs. This is the proponent system for

the common picture (integrates information horizontally and vertically to provide friendly and enemy unit locations). It provides automated assistance in the collection, storage, review and display of information to support the commander's decision process. Both text and map graphics are provided to the user.

**Program Status.** The Army is preparing a test strategy in accordance with the ABCS "Way Ahead" strategy. The IOT&E for MCS is scheduled for 2QFY05 as part of a new Army test strategy.

### **Army Airborne Command and Control System (A2C2S)**

**Description.** A2C2S is the Army's above-the-ground battle command platform that provides the commander with an airborne, self-contained and reliable integrated digital command post that transforms the Army from the Current Force to Future Force. The A2C2S integrated on a UH-60L aerial platform enables the commander and his staff to traverse the battlespace while maintaining situational understanding through C4I connectivity at the decisive point on the battlefield at critical times. It provides a LOS and BLOS voice and digital communications package. This system is fielded to UAs through UEs for OIF. Future plans include variants for the UH-60M aerial platform.

**Program Status.** The program is currently producing LRIP aircraft platforms for FY05. Unit training is ongoing with existing aircraft fielded in 4QFY04 to support the operations in OIF. Other resources are being funded to support the installation of INMARSAT onto the initial LRIP and current assets.

### **Air and Missile Defense Command and Control System (AMDCCS)**



**Description.** AMDCCS provides both C2 and a sensor-to-shooter link for AMD operations. It consists of two components: the Forward Area Air Defense Command and Control (FAAD C2) and the Air and Missile Defense Planning and Control System (AMDPCS). AMDCCS fully automates C4 and ISR linkages, integrates AMD sensors, weapons and C3I, and interfaces with ABCS, GCCS and joint and allied C4I. It provides AMD elements and ADA brigades with a fire control system via the air defense system integrator for monitoring and controlling engagement operations by subordinate battalions.

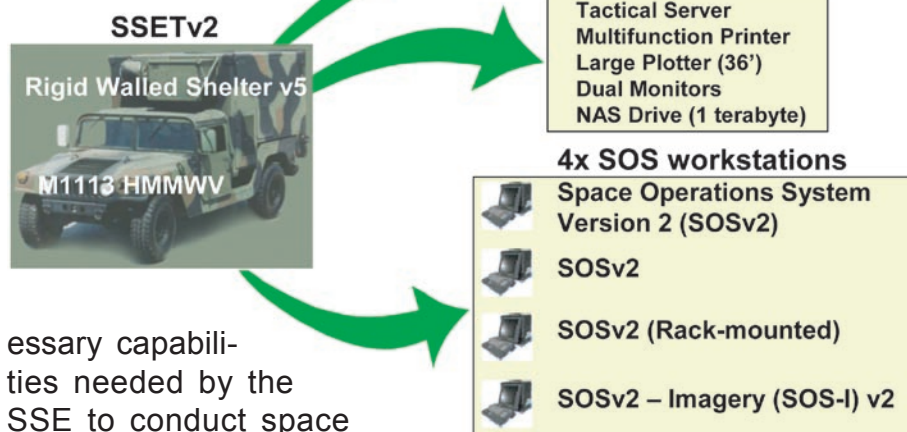
AMDCCS provides a common AMD staff planning and battlespace situational awareness tool via the Air and Missile Defense Workstation (AMDWS), which presents airspace situational understanding to Army commands. This workstation also provides interoperability with JTAMD forces.

**Program Status.** FAAD C2 is an ACAT II program in procurement with an Aug 95 approved ORD. AMDPCS is an ACAT III program in final development with a May 97 approved ORD currently under revision. The FY06-11 program plan funds both FAAD C2 and AMDPCS to provide AMDCCS to all SBCTs

and III Corps units through the fielding of the ADAM Cells.

### **Space Support Element Toolkit (SSET)**

**Description.** The SSET is a mission essential item of equipment for the Space Support Element (SSE) resident within the UEx headquarters. It provides the nec-



essary capabilities needed by the SSE to conduct space operations planning, integration and coordination. These functions aid in enabling the joint force commander to achieve the precision engagement, information superiority and battle command capabilities across the full spectrum of distributed ground force combat operations through better exploitation of space-based systems, products and services. The SSE approach is part of the space operational architecture supporting Current and Future Force requirements as noted within Army doctrine, *TRADOC PAM 525-3-14, Concept for Space Operations in Support of the Future Force* (updated 31 Dec 03). The SSET is currently a non-type-classified COTS/government off-the-shelf (GOTS) prototype system and has been combat tested in OEF and OIF. Employment during OEF and OIF has demonstrated that the space-based products provided by SSET-equipped teams provided enhanced C2 and situational awareness for land force commanders. It consists

of a communications suite, four workstations and ancillary equipment housed in a rigid-walled shelter v5, mounted on an M1113 HMMWV. Initial UEx design incorporates a six-person SSE equipped with an SSET. This limited placement of personnel and equipment will help further refine space support to the tactical force.

**Program Status.** The SSET is an emerging requirement that is not funded in the FY06-11 program. It has been developed through the efforts of the SMDC Space Directorate Battle Lab. ASA(ALT) is in the process of aligning SSET responsibility with appropriate PEO/PM, which will type-classify and certify this

item to transition procurement duties to the materiel developer.

### **Force XXI Battle Command Brigade and Below (FBCB2)**

**Description.** FBCB2 is a joint interoperable, digital, battle command information system for brigade level and below. FBCB2 is designed to provide mounted and dismounted combat elements with near real-time, integrated situational awareness and C2 functionality. FBCB2 enhances the ability of tactical commanders to better synchronize their forces, achieve agility, and gain a “feel” of the battlespace through improved situational awareness and better combat awareness reporting while on the move. FBCB2 is a key component of the ABCS. The FBCB2 operates over both terrestrial communications networks and SATCOM networks; the system con-

sists of a ruggedized computer with a touch screen and keyboard in which the Soldier sees either a digital map or satellite imagery overlaid with icons representing the vehicle's location, other FBCB2/BFT vehicles, known enemy units, and objects such as minefields and bridges. FBCB2/BFT was expeditiously fielded in reduced quantities to every MACOM as well as the USMC and United Kingdom forces participating in OEF and OIF. As a result of lessons learned in OEF and OIF, the Army revised its Army battle command plan to deliver a consistent solution across the force within 18-24 months in order to provide partial "good enough" capabilities over time. FBCB2 requirements were refined to accelerate fielding efforts (OIF-like capability) to the entire Army and 15 eSBs by FY05. In addition,



another 18 eSBs and modular force fieldings have now

been incorporated into the FBCB2

master schedule for execution. After initial fielding efforts are achieved (in FY05), the rest of the key leader option (KLO) distribution efforts will be completed for the AC, six SBCTs, National Guard eSBs and OIF/OEF mission requirements by FY07.

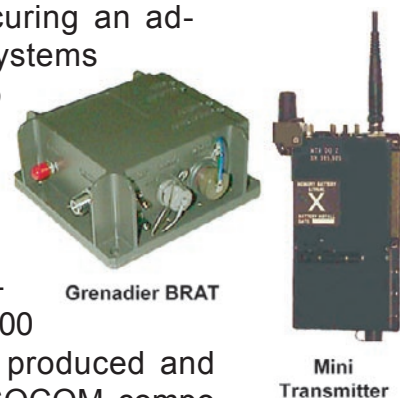
**Program Status.** FBCB2 is currently funded to continue improvements in joint/coalition interoperability, migration to JTRS, future communications studies, Type 1 encryption efforts, software enhancements and the development of satellite spectrum and Tactical Internet interoperability. The program has reached FRP and continues to procure systems for under the Army Fielding Plan (key leader option) for distribution within the FY06-11 planning period.

### **Grenadier BRAT (GB) and Mini-Transmitter (MTX) Blue Force Tracking (BFT) Systems**

**Description.** GB and MTX are BFT systems that take advantage of the existing national space infrastructure. They give commanders the ability to track and receive status reports, in near real-time, from friendly forces that require a low probability of intercept/low probability of detection (LPI/LPD) C2 link. GB and MTX systems substantially enhance security and reliability through the use of LPI/LPD Cobra (collection of broadcasts from remote assets) waveforms, encryption certified by the National Security Agency, and military GPS. A space-based BFT Mission Management Center (MMC) supports GB/MTX use of the existing Cobra architecture by coordinating with national system managers and warfighting units to help collect, process and disseminate warfighter BFT data. During OEF and OIF, the GCCS successfully integrated disparate BFT systems used by different units and services. SOF forces used the Cobra-based BFT systems due to the security advantages, while Coalition Forces Land Component Command (CFLCC) main formations used FBCB2. BFT systems gave operational level commanders the most robust COP to date by substantially increasing their situational awareness.

**Program Status.** Initially fielded 400 GB to USASOC, USAREUR and USARSO. Currently procuring an additional 400 systems for USASOC to support ongoing real-world contingency operations. There are approximately 3,000

MTX systems produced and fielded to USSOCOM compo-



nents; e.g., every USAF Special Operations Command airframe and ground team has an MTX. The GB was acquired as a Warfighter Rapid Acquisition Program product, and the MTX and the MMC were developed and fielded as a result of Combat Mission Needs Statements.

### **Satellite Communications (SATCOM)**

**Description.** SATCOM systems provide a robust, flexible and seamless network capability that extends and in some cases replaces terrestrial capabilities with responsive, BLOS communications throughout the battlefield that permits users to access large databases necessary to support strategic, operational and tactical missions. SATCOM global connectivity supports the command and control capabilities of planning, coordinating, directing and controlling. SATCOM use is essential for the real-time direction of operations at each echelon of command. SATCOM enables tactical forces to exploit improved capabilities to coordinate fires; conduct operational maneuver on the unstructured, asymmetric battlefields of today; assess the effects of previous operations and anticipate enemy actions. An integrated high-capacity SATCOM backbone provides reachback connectivity that allows implementation of split-based command and control and logistics support concepts. This architecture will also support interoperability with joint, coalition, commercial and civil communications networks. As a result, Current and Future Forces will have reliable, on demand, BLOS/NLOS communications for enhanced early warning, en route mission planning and rehearsal, and responsive CSS while maintaining a reduced footprint in theater. Reliable SATCOM enhances increased responsiveness, agility, versatility, survivability and sustainability.

**Program Status.** The Milstar satellite Secure Mobile Anti-Jam Reliable Tactical Terminal (SMART-T) provides a protected (anti-jam) wideband, BLOS capability for Army modular divisions, BCTs and SBCTs. The program is currently in production and continues to be fielded. The Phoenix, an SHF multiband satellite terminal, HMMWV-mounted, air-transportable system was awarded a development contract on 15 Apr 03. The first Phoenix fielding was in Jul 04. Tri-band terminals (X, C and Ku) will be fielded in FY04 and FY05. A quadband upgrade in FY06 will add Ka band. Phoenix will be fielded to echelon above division signal units.

### **Combat Service Support (CSS) Satellite Communications (SATCOM)**

**Description.** The CSS-SATCOM provides rapidly employed, BLOS communications-enabling hardware to logisticians at the tactical and operational levels. The program, which grew out of the G-4 Connect the Logistician Focus Area, provides COTS-based very small aperture terminals (VSAT) and a supporting global infrastructure to logistics activities integrated within and supporting the Army's modular force structure.

**Program Status.** CSS-SATCOM has completed fielding to the 3rd Infantry Division. The system is currently being fielded to the 101st and 10th Divisions and is aligned with the Army Campaign Plan for future fieldings. CSS-SATCOM was designated a formal program in the first quarter of FY05 under the auspices of the Program Executive Office Enterprise Information Systems (PEO EIS). Formal program management constructs will be developed in FY05.

## **Global Positioning System (GPS)**

**Description.** GPS is a space-based radio position/navigation (POS/NAV) system that provides extremely accurate, continuous, all-weather, common grid, world-wide navigation and three-dimensional positioning, velocity and timing information to land, sea, air and space users. Components are the space, ground control and user equipment segments.



**Program Status.** The Defense Advanced GPS Receiver (DAGR) includes the Selective Availability Anti-Spoofing Module (SAASM) and will replace the current Precision Lightweight GPS Receiver (PLGR), which will be cascaded to other units, primarily in the Reserve units. Fielding begins in 1QFY05. The DAGR itself will be replaced by an improved DAGR projected for FY13 when the associated satellite constellation and ground control stations have reached FOC.

## **Single Channel Ground and Airborne Radio System (SINCGARS)**



**Description.** SINCGARS provides commanders with a highly reliable, secure, easily maintained combat net radio that has both voice and data handling capability in support of C2 operations. SINCGARS, with the Internet controller, provides the communications link for the digitized force. The Advanced System Improvement Program (ASIP) models are of a reduced size and weight, providing further

enhancements to operational capability in the Tactical Internet environment.

**Program Status.** A production delivery order was awarded in 3QFY04 to procure congressionally directed assets for the ARNG and SBCTs. As of May 04, approximately 250,000 radios have been fielded.

## **Warfighter Information Network–Tactical (WIN-T)**

**Description.** WIN-T provides an integrating, secure, high-capacity backbone communications network for the Future Force and is now designed to spiral capabilities into the Current Force, enabling them to achieve and sustain complete information dominance at all levels, environments and global locations. WIN-T is an integrated communications network optimized for offensive and joint operations, providing the theater combatant commander with capability to perform multiple missions simultaneously. WIN-T integrates dispersed operations over extended distances from fixed and mobile platforms; is scaleable, tailorable and dynamically adaptive to missions; and consists of a three-tiered architecture (ground, airborne and space) that expands and contracts with the fight. Special features of the network eliminates stovepipe communications systems utilizing a single integrated framework, provides broadband on-the-move communications, and reduces vehicle and Soldier footprints through use of the airborne tier. WIN-T ensures the uninterrupted flow of timely, relevant and actionable information; the right information to the right Soldier, at



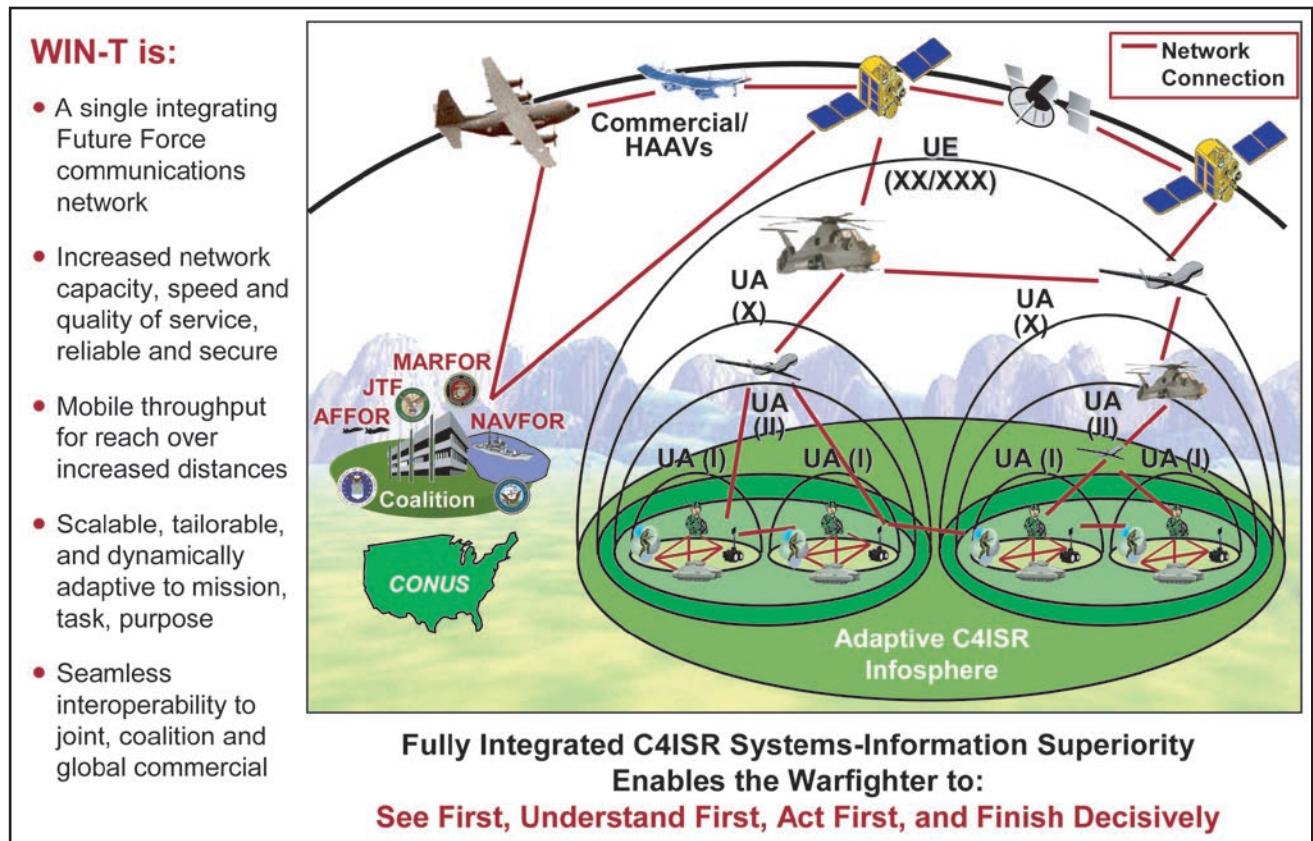


Figure D-10. Warfighter Information Network-Tactical

the right time, while seamlessly linked to the Joint Tactical Radio System (JTRS).

**Program Status.** On 10 Sep 04, the Defense Acquisition Executive (DAE) authorized a revised acquisition approach, which calls for combining the two prime SDD contractors into a single team. General Dynamics is now the single prime contractor with Lockheed Martin as its major subcontractor. The acquisition details are presently being worked on, keeping the program aligned with FCS, and posturing it for initiatives to provide capabilities to the Current Force. Currently, development and operational testing is scheduled for 1QFY06, with Milestone C approval is scheduled for 2QFY06. Production contract award/LRIP is scheduled for 2QFY06 with an initial operational test scheduled for 4QFY08.

### **Joint Tactical Radio System (JTRS)**

**Description.** JTRS is a family (ground, air and maritime domains) of common software-defined radios that provide seamless network connectivity throughout the battlefield in support of *Joint Vision 2020* objectives. JTRS is the military's affordable, mobile, high-capacity, lightweight, multiband radio system providing simultaneous voice, data and video communications. JTRS replaces 32+ currently fielded radio systems and will be a key component of the Tactical Internet using a family of network waveform applications. The Army is the executive agent for the JTRS program and is the lead Service for developing and testing all waveforms and certifying Software Communications Architecture (SCA) compliance. Additionally, the Army is responsible for two (Clusters 1 and 5) of the three primary Cluster

efforts (Clusters 1, 5 and AMF). Cluster 1 is developing the ground vehicular and airborne rotary-wing aviation form factors, while Cluster 5 is developing the handheld, manpack, and small form fit form factors.

**Program Status.** Cluster 1: The JTRS ORD was updated in Apr 03 to Version 3.2. JTRS Cluster 1 is in the SDD phase. Cluster 5: JTRS Cluster 5 received a successful Milestone B decision on 26 Apr 04 and awarded a SDD contract to GDDS on 16 Jul 04. A Milestone C decision is scheduled for 2QFY08. The JTRS Cluster 5 program is pursuing a two-spiral acquisition strategy. Spiral 1 focuses on the near-term manpack requirements, while Spiral 2 focuses on the technology needed to meet current and future warfighter requirements. JTRS Cluster 5 is structured to be synchronized with Project Manager UA and Land Warrior program capabilities and time lines.

### **Bridge-to-the-Future Network (BFN)**

**Description.** BFN is the Army's bridging strategy to deliver increasing net-centric capabilities into the Current Force today, and will be followed by the initial transition to the WIN-T capability. Capability enhancements are increased voice, data and video services that are joint network ready and supports the Army's modular force designs (UA brigades, Units of Employment (UEX, division 2-star and UEX 3-star) and (UEY, theater)). BFN fuses the Army's Joint Network Node (JNN), Connect the Logistician—Combat Service Support (CSS), and intelligence Trojan Spirit initiatives into a single "good enough" strategy to deliver increased capabilities to the warfighter today.

BFN will provide the Current Force with a state-of-the-art COTS communications back-

bone network (high-speed and high-capacity) that will enable them to exchange information (voice, data and video) throughout the tactical UEY and into the sustaining base. The objective of the BFN is to incrementally insert increased capability COTS solutions to the Army's Current Force to satisfy Current Force capability gaps. BFN capability increments build off the recapitalization of the current Mobile Subscriber Equipment (MSE) and TRI-Services Tactical Communications (TRI-TAC) tactical communications systems.

**Program Status.** JNN was fielded to 3ID with fielding to 4th ID, 10th ID and 101st AA ongoing with anticipated completion 4QFY05/1QFY06.

### **Joint Network Node (JNN). (formerly known as the Area Common User System Modernization Plan (ACUS MP)**

**Description.** JNN is the Army's component of the GIG and provides Army interconnectivity when embedded within the joint task force and ties in network-centric enterprise services via GIG-bandwidth expansion. Spiraling JNN into the force will provide commercial satellite augmentation to Army MILSATCOM, Internet Protocol (IP)-based services, voice-over IP (VOIP) augmentation to Defense Switched Network (DSN), unclassified/classified Internet down to the battalion level, secure digital telephone down to brigade level, and situational awareness. JNN provides a high-speed, high-capacity network communications backbone connection that is joint-capable, supports the warfighter's rapid movement and simultaneous operations, and disseminates information will all levels of security. Key items of the JNN are a SATCOM hub node, a joint network node, and a battalion command post (Ku SATCOM) node, as well as embedded local area network components.

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**Program Status.** The FUE with the JNN is the 3rd Infantry Division with fielding completed in Oct 04. Fielding of the next three spirals (101st AA, 4th ID and 10th Mountain) began in Jan 05.

### **Command and Control (C2) Summary**

Army C2 and JC2 supported by fully leveraged communications and computers and ISR capabilities are at the core of realizing the required characteristics envisioned in the Future Force. Networked communications and intelligence packages will dramatically improve command and control, making it possible to achieve significant advances in strategic responsiveness. The Army has already made important steps towards this goal. The ABCS and the C4 and ISR infrastructure for the current digitized forces provides a real-time blue force picture to ground maneuver units. The artillery and AMD components of ABCS are interoperable with both joint and multinational systems. ABCS can also

leverage theater assets such as JSTARS. During OEF and OIF, the Army demonstrated a significant increase in combat power when it exercised these capabilities. The Army will continue to incorporate lessons learned from operating ABCS in developing the C4ISR infrastructure for the Future Force.

### **Annex D Summary**

Annex D of the *2005 Army Modernization Plan* provides an overview of key Army materiel programs funded in PB06. These programs are framed within the five emerging joint functional concept/capability categories used by the new Joint Capabilities Integration and Development System (JCIDS) process to analyze Joint Force future requirements and guide Army and other Service modernization efforts towards those requirements as they emerge. Other annexes in the *2005 Modernization Plan* examine modernization paths of doctrine, training, installations, personnel and force structure.

